

# POPULAR MECHANICS

FEB. 1969  
50 CENTS

FIRST  
REPORT  
From  
AMX  
Owners  
Page 146

## WINTER DRIVING TIPS

How to Keep Going on Icy Turnpikes  
And Mountain Roads Page 96

## DAYTONA '500' PREVIEW

Can Chrysler Put the Crunch on Cale?

**BUILD THESE:** Tent Camper •

Model Brass Cannon •

Colonial Desk •

Plus 5 Weekend  
Projects!

Boat-Camping

On Lake Powell in

Glastron's New Vagabond

Bright Ideas for a Beautiful Bar • New Fire Alarms for Your Home

What's New in Station Wagons • How to Do More on a Circular Saw

Saturday Mechanic: Rebuilding Your Carburetor • Drivin' With Dan Gurney • Auto Clinic





We brew every bottle of Miller High Life as if it were the only one



Miller  
makes it  
right...  
The Champagne of Bottle Beer



# Important! Don't skip over the next seven pages.

---

Unless, by chance,  
you married into money,  
or know it all,  
or can't stand praise,  
or don't want your pay to escalate,  
or figure you're too old to learn,  
or refuse help,  
or can never be fired,  
or have no urge to succeed,  
or don't like to read anyway.

**This One**



548L-P1Y-AA85



# How to boost the payload you carry between your ears.

---

## The importance of NOW!

You couldn't pick a better time to begin a course of specialized training.

Business is on dead center. There's no real prosperity, no real recession.

It's a wait-and-see period, a time for companies to size up employees in preparation for the predicted boom.

Get yourself ready—through home study. It offers important advantages:

Your time is your own when you study at home. You waste none of it commuting to and from class.

You set your own schedule, your own pace.

You learn while you earn, pay as you go.

You learn quickly. Nobody holds you back.

Rewards can come quickly, too. Many students get the promotions and pay raises they want even before they complete their course.

But the time to act is NOW.

## Here's HOW:

I. C. S. is your best bet.

Not just because it's the oldest, largest, most respected of the home study schools.

But because it offers exactly what you want. With 253 programs, you have a much wider selection than from any other school . . . anywhere. (Each program is prepared by a recognized authority, edited by home study experts, guided step-by-step by a personal instructor.)

And because I. C. S. training pays off.

One recent survey showed that the average I.C.S. graduate increased his income by \$1000 within two years.

Another revealed that one out of every fourteen company presidents (men who made it all the way to the top) studied with I. C. S. at one time in their careers.

A magazine writer once called I. C. S. "The Harvard of home study institutions."

Find out why.

---

### Free I. C. S. Success Kits

In addition to a special catalog describing the courses in your field of interest, I. C. S. will send you free the helpful 28-page handbook, "How to Succeed," together with an actual lesson demonstrating the I. C. S. method.

Mark and mail the coupon at the bottom of any of the following pages or the postage-paid card you'll find at the end of this section.



# To excel in Electronics, Radio-TV, specialize.

## A wise choice!

If you've selected Electronics-Radio-TV as the field in which you want to make good, you've chosen wisely.

No other field has a greater demand for skilled specialists, or a bigger shortage.

There are more good jobs than there are qualified men and women to fill them.

General training is essential. But, more and more, you're going to need specialized training in specific areas.

You're going to need the kind of training in depth that I. C. S. can give you, with 26 courses—far more than you can get from other leading schools.

But you owe it to yourself to compare schools, to select the right one for you.

That's just what the catalog (below) will help you do.

## A wide choice:

1. Color Television Principles & Servicing
2. Communications Technology

3. Electronic Fundamentals
4. Electronic Fundamentals Programmed Course
5. Electronic Instrumentation & Servo Fundamentals
6. Electronic Principles for Automation
7. Electronics & Applied Calculus
8. Electronics Technician
9. First Class Radiotelephone License
10. Fundamentals of Electronic Computers
11. General Electronics
12. Hi-Fi Stereo & Sound Systems Servicing
13. Industrial Electronics
14. Industrial Electronics Engineering
15. Industrial Electronics Engineering Technician
16. Numerical Control Electronics & Maintenance
17. Practical Radio & TV Engineering
18. Practical Telephony
19. Principles of Radio-Electronic Telemetry
20. Principles of Semiconductor-Transistor Circuits
21. Radio & Television Servicing
22. Second Class Radiotelephone License
23. Sound Systems Specialist
24. Telephony, Electronics & Radio Communications
25. Television Receiver Servicing
26. Television Technician

Send this coupon or postage-paid card at end of this section



I. C. S. Dept. G0569A, Scranton, Penna. 18515

Please send me "ELECTRONICS," your free 68-page catalog listing all 26 Electronics, Radio and TV courses with complete details. Also send "How to Succeed" and sample lesson.

Mr. \_\_\_\_\_ Age \_\_\_\_\_ Address \_\_\_\_\_  
Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_ Working Hours \_\_\_\_\_ A.M. to \_\_\_\_\_ P.M.  
Occupation \_\_\_\_\_ Employed by \_\_\_\_\_  
Low rates to members of U. S. Armed Forces.  
Approved for veterans under New G. I. Bill.



# Sixty-seven ways to succeed in Business.

... with or without a computer.

Take a look at the want ads in today's newspaper. Note the many openings in all phases of Business.

Now check the list of courses on this page.

You'll see a similarity, because I. C. S. accurately anticipates and meets the needs of Business, stays on top of the times.

Take computer training, for example. There are four programming courses for business people, as up-to-date as you'll find anywhere.

There's an I. C. S. course for just about anyone in Business. For clerks, stenographers and typists who want to move up. For foremen and supervisors. For junior executives. For those now in business for themselves... and those who'd like to be.

Select a program of training that meets your specific needs. The catalogs below can help you.

## Choose yours:

### Accounting

- |  |                           |
|--|---------------------------|
| 1. Accounting for Business Programmers | 6. Estate & Trust Acc't'g |
| 2. Auditing                            | 7. Executive Accounting   |
| 3. Business Law                        | 8. Federal Tax            |
| 4. Cost Accounting                     | 9. General Accounting     |
| 5. C.P.A. Review                       | 10. Industrial Accounting |
|  | 11. Junior Accounting     |
|  | 12. Legal Accounting      |

13. Office Accounting
14. Practical Accounting
15. Public Accounting
16. Small Business Acc't'g
17. Starting & Managing a Bookkeeping Service

### Business

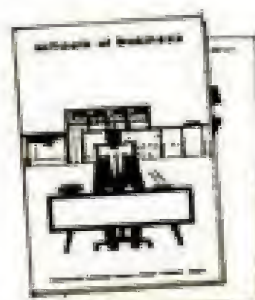
18. Advertising
19. Basic Inventory Control
20. Basic Supervision
21. Business Administration
22. Business Management & Production
23. Clerk-Typist
24. Commercial
25. Cond. Business Practice
26. Condensed Marketing
27. Creative Salesmanship
28. Direct Mail & Mail Order Advertising
29. Engineering Secretary
30. Industrial Foremanship
31. Industrial Psychology
32. Industrial Supervision
33. Legal Secretary
34. Mag. & Newspaper Adv.
35. Man'g't & Marketing
36. Managing a Small Store
37. Marketing
38. Marketing Research
39. Medical Secretary
40. Modern Exec. Man'g't
41. Modern Woman as a Supervisor

42. Motor-Traffic Man'g't
43. Office Automation
44. Office Management
45. Personal Income Tax Procedure
46. Personnel-Labor Rel't'n
47. Professional Secretary
48. Purchasing Agent
49. Railway Rate Clerk
50. Real Estate Salesmanship
51. Retail and Local Adv.
52. Retail Bus. Man'g't
53. Retail Merchandising
54. Retail Selling
55. Sales Management
56. Salesmanship
57. Salesmanship & Sales Management
58. Shorthand
59. Stenographic
60. Supervision
61. Systems & Procedures Analysis
62. Traffic Management
63. Typewriting

### COMPUTER COURSES

64. COBOL Programming
65. Programming for Digital Computers
66. Programming for IBM 1401 Computer
67. Programming IBM System/360 Computer

Send this coupon or postage-paid card at end of this section



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☐ Accounting

☐ Business

Mr. \_\_\_\_\_ Age \_\_\_\_\_ Address \_\_\_\_\_

Miss \_\_\_\_\_

Mrs. \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_ Working Hours \_\_\_\_\_ A.M. to \_\_\_\_\_ P.M.

City \_\_\_\_\_ Occupation \_\_\_\_\_ Employed by \_\_\_\_\_

Low rates to members of U. S. Armed Forces.

Approved for veterans under New G. I. Bill.



# Power up for big pay. Get technical.

## Where there's a will . . .

Industry is desperate for men with technical training. Colleges and trade schools can't begin to fill the need.

Become an I. C. S.-trained technician or engineer and you'll be on your way.

With good reason: I. C. S. has the largest home study School of Technology in the world, offers the most complete and comprehensive curriculum.

Courses start at operator levels, go up to Chemical, Civil, Electrical, Mechanical and Power Engineering.

There are special refresher courses for the graduate engineer who wants to keep up to date. Also special courses for management men who must make engineering decisions—and vice versa.

Make a decision now to get the facts.

## . . . there are 68 ways:

### Chemical

1. Analytical Chemistry
2. Chemical Engineering
3. Chemical Engineering Unit Operations

### 4. Chemical Laboratory Technician

5. Chemical Process Oper.
6. Elements of Nuclear Energy

7. General Chemistry
8. Instrumental Laboratory Analysis
9. Natural Gas Prod. & Transmission
10. Oil Field Technology
11. Paper Machine Operator
12. Paper Making
13. Petroleum Production
14. Petroleum Prod. Eng'r's
15. Petroleum Ref. Oper.
16. Pipeline Engineering Technology
17. Plastic Technician
18. Pulp & Paper Eng'r's Technology
19. Pulp & Paper Making
20. Pulp Making

### Civil

21. Civil Engineering
22. Construction Eng'r's
23. Highway Engineering
24. Math & Mech. for Eng'r's
25. Principles of Surveying
26. Reading Structural Blueprints
27. Reading Hwy. Blueprints
28. Sanitary Engineering
29. Sewage-Plant Operator
30. Structural Drafting
31. Structural Engineering
32. Surveying & Mapping
33. Water-Works Operator

### Electrical

34. Elec. Appliance Ser.
35. Electrical Contractor
36. Electrical Engineering
37. Elec. Eng'r's Tech.

38. Elec. Instrument Tech.
39. Elec. Motor Repairman
40. Industrial Elec. Tech.
41. Power Line Design & Construction
42. Power Plant Operator
43. Practical Electrician
44. Practical Lineman
45. Reading Elec. Blueprints

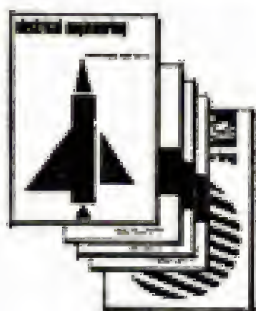
### Mechanical

46. Aircraft & Power Plant Mechanic
47. Domestic Refrigeration
48. Fortran Prog. for Eng'r's
49. Hydraulic & Pneumatic Power
50. Industrial Engineering
51. Ind. Eng'r's Tech.
52. Industrial Management for Engineers
53. Machine Design
54. Mechanical Engineering
55. Quality Control
56. Refrigeration
57. Refrigeration & Air Cond.
58. Safety Eng'r's Tec'l'gy
59. Tool Design
60. Value Analysis
61. Vibration Analysis & Control

### Power

62. Boiler Inspector
63. Industrial Bldg. Eng'r's
64. Industrial Inst.
65. Power Plant Eng'r's
66. Stationary Diesel Eng's.
67. Stationary Fireman
68. Stationary Steam Eng'r's

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I. C. S. Dept. G2569A, Scranton, Penna. 18515

Please send me the free catalog which I have checked below, plus 28-page handbook, "How to Succeed," and sample lesson. ☐ Chemical ☐ Civil ☐ Electrical ☐ Mechanical ☐ Power

Mr. \_\_\_\_\_ Age \_\_\_\_\_ Address \_\_\_\_\_  
 Miss \_\_\_\_\_  
 Mrs. \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_ Working Hours \_\_\_\_\_ A.M. to \_\_\_\_\_ P.M.  
 Occupation \_\_\_\_\_ Employed by \_\_\_\_\_  
 Low rates to members of U. S. Armed Forces.  
 Approved for veterans under New G. I. Bill.



# There's real Jack in all trades. Master one.

## It takes a real man!

Mastering a trade... going into business for yourself... these are among the most satisfying and rewarding of careers—with base pay up to \$7 an hour.

But it takes guts. And sound training.

With I. C. S. you have the advantage of guidance by experts in your field.

Texts are easy to follow. You learn from pictures, tables, step-by-step diagrams and from doing practical projects.

Your instructor takes a personal interest in your progress, gives you encouragement and suggestions, helps you move ahead fast.

The toughest part is making up your mind to mail the coupon (or card on the next page).

The rest comes easy!

## And it takes real training!

### Automotive Trades

1. Automatic Trans. Spe'l'st
2. Automobile Body Rebuilding & Refinish'g
3. Automobile Elec. Tech.
4. Auto. Eng. Tune-Up
5. Automobile Technician
6. Automotive Mechanic
7. Diesel-Gas Motor-Vehicle Engines

### Building Trades

8. Air Conditioning
9. Air Cond. Maintenance
10. Building Contractor
11. Building Estimator
12. Building Inspector
13. Building Maintenance
14. Carpenter-Builder
15. Carpentry & Millwork
16. Domestic Heating with Oil & Gas
17. Heating & Air Cond.
18. Industrial Heating
19. House Planning & Interior Design

20. Indust. Air Conditioning
21. Mason
22. Painting Contractor
23. Pipe Fitting
24. Plumbing
25. Plumbing & Heating
26. Practical Plumbing

### Shop Practice

27. Drill Operator
28. Foundry Practice
29. Industrial Metallurgy
30. Lathe Operator
31. Machine Shop Practice
32. Machine Shop Inspection
33. Metallurgical Eng. Tech.
34. Milling Machine Oper.
35. Multicraft Maint. Mech.
36. Practical Millwrighting
37. Rigging
38. Tool Eng. Technology
39. Tool Grinder
40. Toolmaking
41. Turret Lathe Operator
42. Welding Eng. Technology
43. Welding Processes

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# Make your mark in Drawing, Drafting or Architecture.

## Make your talents pay off!

The combination of a trained mind and a skilled hand commands universal respect—and a great deal of money.

Your ability to visualize, to create, to communicate through line and detail, opens up unusual career opportunities.

Some people start with talent. Others develop it. But talent alone is not enough.

You need to train it, refine it, make it pay off in money and satisfaction.

This is where I. C. S. can help you.

You learn by doing. You submit drawings and designs with each assignment. And you get back professional critiques.

Start by making your mark below.

## Your choice of 24 ways:

### Architecture

1. Arch. Drawing & Des'g'ng
2. Design of Plastic Prod.
3. House Planning & Interior Design
4. Review in Arch. Design & Practice
5. Review of Mechanical Systems in Buildings
6. Reading Architect's Blueprints

### Art

7. Amateur Artist
8. Commercial Art
9. Commercial Cartooning
10. Illustrating
11. Interior Decorating

12. Oil Painting for Pleasure
13. Show Card & Sign Prod.
14. Show Card Writing
15. Sign Painting & Designing
16. Sketching & Painting

### Engineering Drawing

17. Aircraft Drafting
18. Architectural Drafting
19. Design Drafting
20. Drafting Technology
21. Electronic Drafting
22. Pressure-Vessel & Tank Print Reading
23. Sheet-Metal Layout for Air Conditioning
24. Structural Drafting

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City \_\_\_\_\_ Occupation \_\_\_\_\_ Employed by \_\_\_\_\_ Low rates to members of U. S. Armed Forces. Approved for veterans under New G. I. Bill.



# 68,000 reasons to finish High School.

## It's never too late, BUT . . .

There's a \$68,000 difference between the lifetime earnings of the average High School graduate and that of the dropout.\*

That's money you and your family could use—if you had a High School education.

Government facts show other differences:

- you're more likely to lose your job.
- you stand twice the chance of being out of work for 15 weeks or more.
- the few jobs open to you are almost sure to be the lowest-pay ones.

But—no matter how old you may be—it's not too late to get help the I. C. S. way.

With I. C. S., you take only those subjects you need, with personalized guidance.

You can earn an I. C. S. High School diploma, respected by business and industry.

In short, you can overcome the awful handicap of an incomplete education—now!

\*Source: H. E. W. Dept. figures, 1965

## Pick only the subjects you need:

1. High School Business
2. High School College Preparatory (Arts)
3. High School College Preparatory (Engineering & Science)
4. High School General
5. High School Secretarial
6. High School Vocational
7. Special High School Courses (These include a selection of some 50 Elementary, High School and Advanced subjects you may elect to round out your education.)
8. Advanced Mathematics
9. High School Mathematics

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Please send me a free copy of "High School," your new 40-page catalog detailing the I. C. S. High School Program. Also send 28-page handbook "How to Succeed" and sample lesson.

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Miss \_\_\_\_\_  
Mrs. \_\_\_\_\_  
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# The principle behind and in front of Renault automobiles.



THE FRONT ENGINE, FRONT-WHEEL DRIVE RENAULT 16.



THE REAR ENGINE, REAR-WHEEL DRIVE RENAULT 10.

The basic principle behind the Renault 10 and in front of the Renault 16 is exactly the same: The engine has weight. Put it where it'll do the most good. Over the drive wheels.

It's only common sense. When you have the weight of the engine bearing down on the drive wheels, they get a much better grip on the road. We learned long ago that you can't expect the very best traction when you put an empty trunk over the drive wheels.

When we make a car with rear-wheel drive, we put the engine in the rear. When we make a car with front-wheel drive, we put the engine up front.

And since we don't put the

engine and drive wheels on opposite ends of the car, we don't have to connect them with a bulging, heavy drive shaft. So there's no dead weight to steal

power (and gas). And no extra bulk to steal leg room.

Despite a difference in price (the Renault 10 is \$1775\* and the Renault 16 is \$2445\*), they

both have many other things in common.

Both cars are gas scrimpers. The Renault 10 can get 35 m.p.g. The Renault 16 can get 30.

Both come with sealed liquid cooling systems, virtually eliminating the bother of anti-freeze.

Both come with wet cylinder sleeves, 4 doors, 4-wheel independent suspension, and a 5 main-bearing engine.

In short, both come with very much the same kind of thinking. Behind. In front. Inside and out.



THE RENAULT 10 SEDAN



THE RENAULT 16 SEDAN-WAGON



FOR MORE INFORMATION SEE NEAREST DEALER OR WRITE: RENAULT INC., 100 SYLVAN AVENUE, BOX 38 ENGLEWOOD CLIFFS, NEW JERSEY 07632





The Transport Wide Oval truck tire—for all wheel positions. Available with white sidewall.



The Town & Country Wide Oval truck tire—new drive-wheel tire for all-season traction.

## Wide Oval truck tires—built extra wide for that extra weight.



Two broad-shouldered nylon cord truck tires. Built to cut a wide trail into camping country. On and off the beaten path.

First: The Transport Wide Oval truck tire. Now original equipment on new pickup campers. With wider tread—for more traction, more flotation, less sway than regular truck tires.

Second: The Town & Country Wide Oval truck tire. A new drive-wheel tire. With a hungry tread design that bulls its way. Through soft gravel. Through mud. Through the roughest camping country anywhere.

Added Wide Oval advantages: Sure starts and safe stops. Softer rides. Heavier loads.

Get Wide Oval truck tires at your Firestone Safe Tire Center. Or... specify them on your new camper.

Transport WIDE  OVAL. Town & Country WIDE  OVAL  
—Firestone T.M.s. Transport®, Town & Country®

# Firestone



Life insurance  
for you, your wife,  
all the kids...  
\$20,000 worth  
for \$17<sup>30</sup> a month.



When he was 25, Gene Taylor wanted life insurance a young father could build on. So he covered the whole family with a single policy. \$10,000 permanent insurance on himself, \$4,000 term on his wife, and \$2,000 term on each of the 3 children. Talk to the "good hands" people about the Family Plan.

Allstate—  
the company that  
makes life a lot easier  
for the young  
family man.

You're in good hands with Allstate®

Allstate Life Insurance Company, Northbrook, Illinois





# POPULAR MECHANICS®

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Cover Illustration by Ed Valigursky  
*How to keep going on icy turnpikes and mountain roads.*

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Amazing New Way to "See" a Tornado Coming on Your TV. It may save your life.  
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What Owners Say About Dodge Coronet. Another exclusive PM Owners Report.



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## LETTERS TO THE EDITOR

### Missed the target

Some significant facts were omitted or blurred in the editing of my article on hypervelocity impact (*Faster Than a Speeding Bullet*, page 130, Dec. PM).

The research described was done by Prof. Ray Kinslow, chairman of the engineering science faculty at Tennessee Tech, under contract from the Air Force. Prof. Kinslow's studies have received international attention. He used the facilities of Arnold Engineering Development Center at Tullahoma, Tenn., for the actual firing of pellets into target materials at high speeds.

COOKEVILLE, TENN.

DOUGLAS NORMAN

### Another money-saver

Congratulations on *How to Save Money When You Finance a Car* (page 94, Dec. PM). Here's another tip you might like to pass on:

I borrowed money against my insurance policy at 5% true interest rate, and then I paid cash for the car. I made monthly payments to a savings account (5% annual, compounded daily, paid quarterly). I repaid the insurance company 13 months later. No, you don't eliminate the interest, but it sure reduces it!

SUNNYVALE, CALIF.

DAVID D. DELINE

### Don't crank that engine

In *Prepare Your Car to Beat the Cold* (page 136, Dec. PM) you make the statement on page 138 that the ohmmeter "should read no more than 1/2 ohm as the engine is being cranked."

If there is ever a no-no that should be followed in electronics, it's this: Never put an ohmmeter in a circuit that has current flowing through it. If you do you will have a mess of shunt resistors and meter movements in your meter that will be burned out.

OWOSSO, MICH.

DENNIS TOMLINSON

"Yipes . . . he's right," agrees author Mort Schultz. "That sentence should read 'no more than 1/2 ohm—period.' An ohmmeter is never connected in a live circuit."

### Best lesson

Congratulations on the fine article by A. R. Roalman (*'Grounded' for 90 Days*,

[Please turn to page 8](#))

POPULAR MECHANICS



# "Look who's smiling now!"

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## LETTERS

(Continued from page 6)

page 61, Nov. PM). If more persons would take the attitude shown by Mr. Roalman, there would be only a small percentage of suspensions shown today. The author's obedience to the law in not driving during this 90-day period apparently gave him more of a lesson than anything in the way of fines or other penalties could do.

It might be interesting to note that in the State of Oregon, as well as other states, if you do drive while under suspension, not only do you pay a stiff fine and spend a minimum of two days in jail, your automobile is impounded up to 120 days—which means in most cases that you cannot have your wife chauffeur you around because you no longer have wheels.

BAKER, ORE.

JOHN V. BRENNAN  
MUNICIPAL JUDGE

### River pilots

My friend and I must have read *We Took a Houseboat Vacation* (page 100, Nov. PM) at least four times apiece.

For the past couple of years, we have been trying to find something out of the ordinary to do on our next summer va-

cation. When we read of the Linkletter family excursion, we decided we would like to try it ourselves. Our parents have consented to let us go if we get some navigation lessons first, but we do not know where these lessons are given.

CHICAGO

STEVEN JACOBS

"Characteristically, I did things backwards," comments author John Linkletter. "I took the houseboat cruise in the summer and then decided to take the Power Squadron piloting course in the fall. I'd have felt much less a novice if I'd had the piloting course first.

"The piloting course is excellent—and it's free. You can find the location nearest your home by querying Headquarters, United States Power Squadrons, P.O. Box 510, Englewood, N.J. 07361.

"As for the houseboat, you can buy one, build one (see *Build This Houseboat for Under \$1000*, page 158, Jan. PM), or rent one (see page 10 of the January Letters for leads on where to find the houseboat rentals). ★ ★ ★

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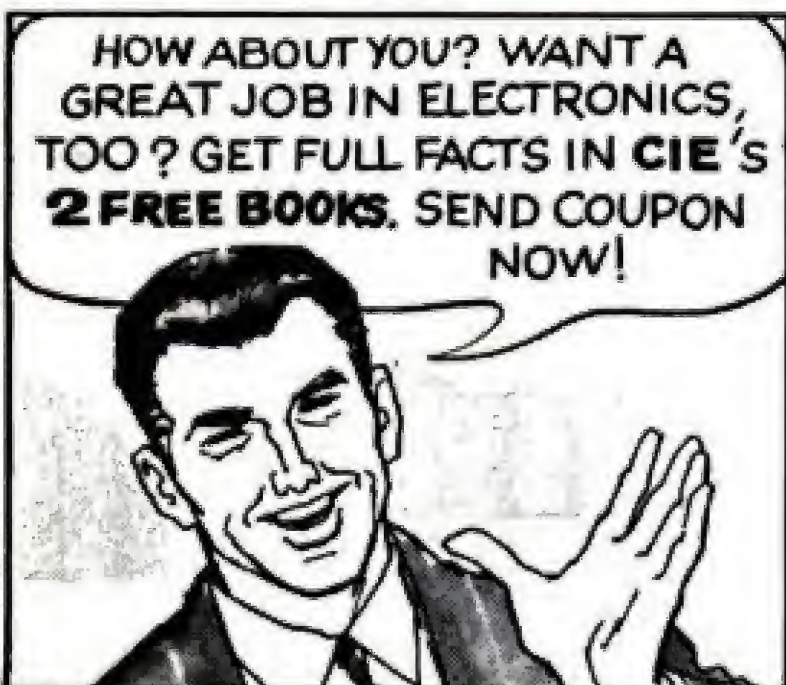
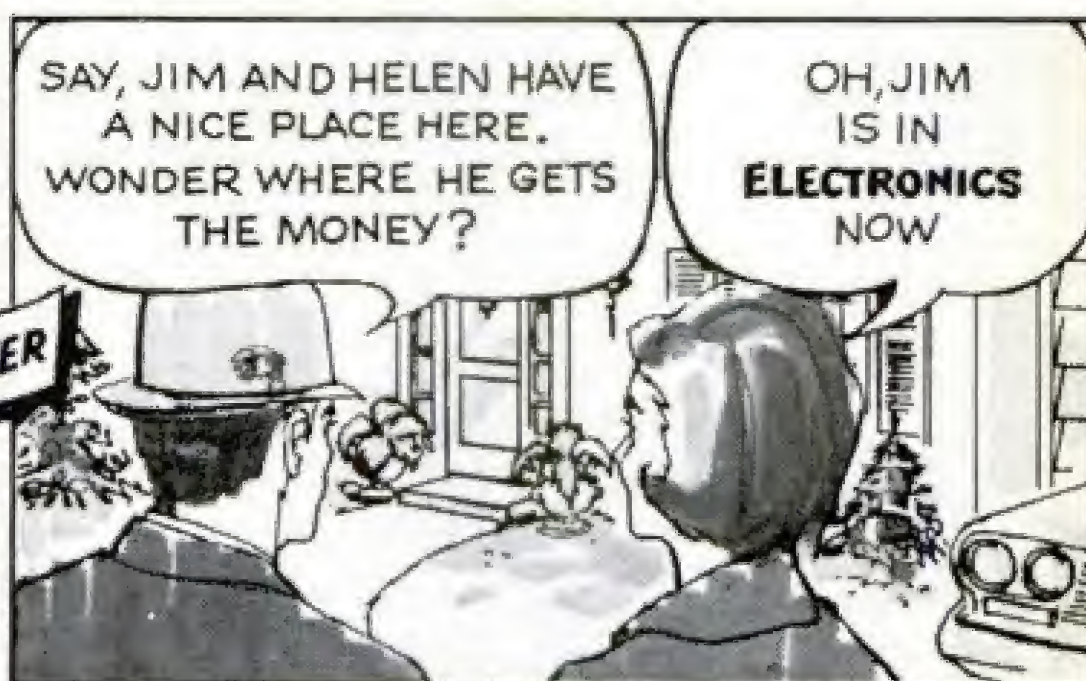
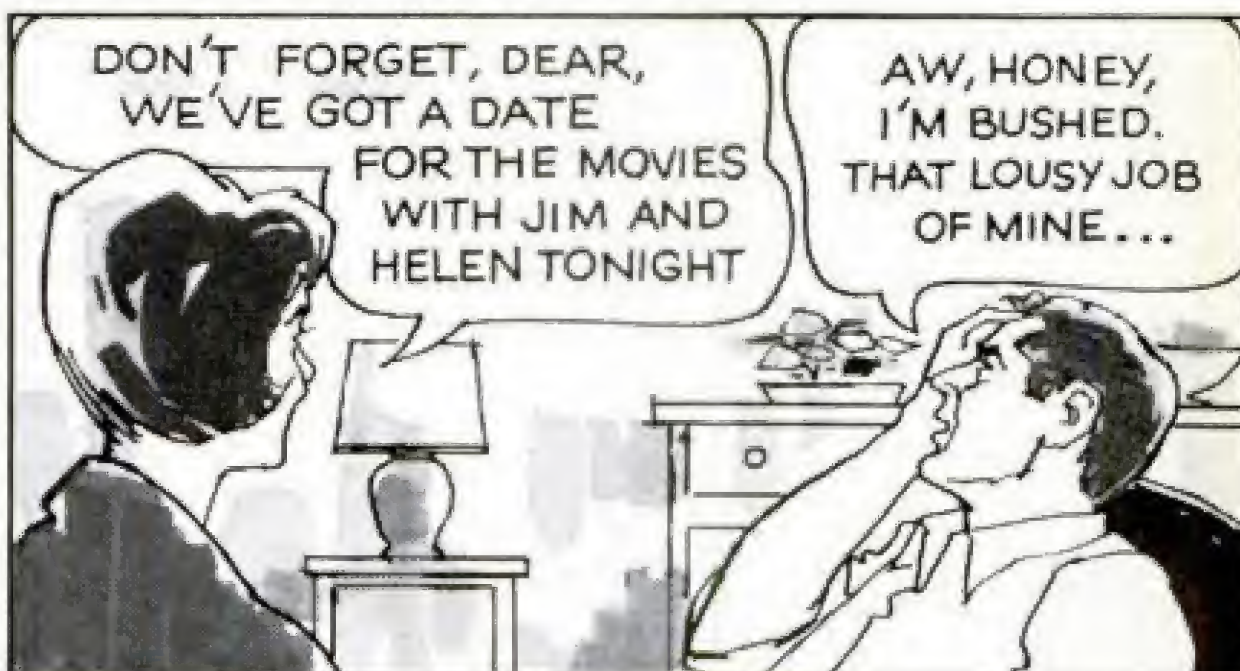
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PM-21





# I'd like to give this to my fellow men...

## while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish*! And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned*! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

### I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

### A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

### Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

### Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

**VICTOR B. MASON**  
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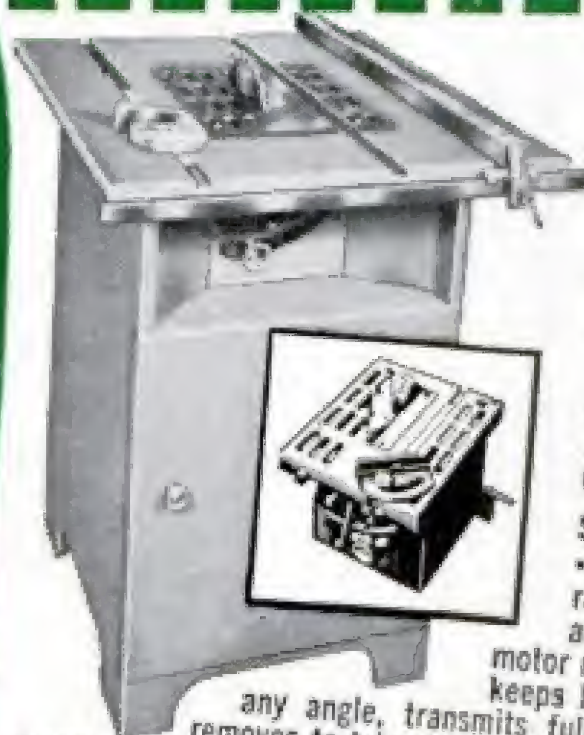
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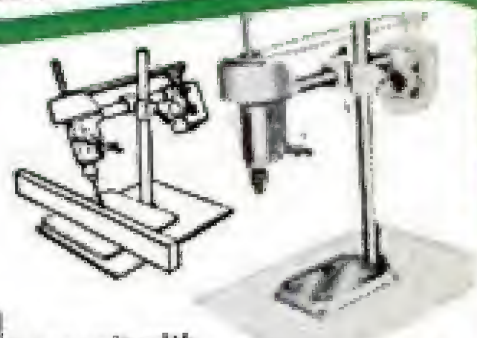
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DETROIT

# LISTENING POST

BY BILL KILPATRICK

**YOU CAN COUNT ON** significant styling changes in certain of the 1970 cars. Due for the most extensive restyling are the so-called "personal" cars, particularly those at the premium end of the price range, and one or two of the out-and-out luxury cars, the Lincoln Continental being the best bet to get a thorough going-over. Buick's Riviera and Oldsmobile's Toronado, which share the same basic shell, will debut with all-new bodies, promised to be entirely different from the current (and new this year) Pontiac Grand Prix. Also rumored to be an extensively restyled car is the '70 Thunderbird. So, what with all the all-new cars—the subcompacts, the Dodge Challenger, a new Plymouth Barracuda, and so on—plus the usual face-liftings, 1970 could turn out to be a bonanza styling year.

**AUTO EXECUTIVES ARE TAKING A SECOND LOOK** at auto shows, the thought being they don't generate enough business to offset their high cost. Shows are becoming more and more elaborate, require increasingly expensive displays, extensive personnel to man them. Shows seem to attract mainly coin-shy youngsters, have heretofore been rationalized on the theory of building brand loyalty. Random interviews of typical "kid" spectators, however, indicate brand loyalty is formed long before they ever get around to visiting an auto show, leading some execs to think maybe the industry—by supporting the big, flashy shows—is merely taking in its own laundry. Asked what it cost his organization to exhibit its wares at the recent Detroit Auto Show, Dodge headman Bob McCurry replied, in a flat voice, "A fortune."

**MAVERICK** will be the name of Ford's new subcompact, due to bow April 1. Car all along has been called Delta, one of several names Ford "leaked" to the industry's rumor mills. Company paid a substantial price for exclusive use of the name, had to buy it from a Canadian manufacturer who used "Maverick" for a line of auto accessories.

**FORD STATION WAGONS**, which at one time seemed like the only game in town, will make a strong bid next year to become again synonymous with the wagon concept. Due are a heavy ad and promotion campaign aimed to push several styling features, the most eye-catching to be a swivel front seat on the passenger side. The seat can be locked to face forward or turned about and locked to face to the rear. The idea, an old one, appeared most recently on Chrysler's LeBaron Imperial.

**A NEW VERSION OF MERCURY'S COUGAR** may be offered later on this year. Called "Eliminator," the car will feature a unique, pearlescent, one-color-only (radiant sun gold, no less) finish, front and rear spoilers, a blocked-out grille, Ford's big 428-cu.-in., 335-hp engine. The front spoiler is attached to the valance panel under the bumper, the adjustable rear spoiler to the backs of the rear fenders, forming a winglike structure over the back edge of the trunk lid. At speeds of over 100 mph (ye gods!) the spoilers are said to reduce drag by as much as 10 percent.

**THE MIDNIGHT OIL** is being burned at American Motors as last-minute changes are being made on the company's all-new subcompact. The car originally was going to be an extensively redone Rambler, but when AMC brass got wind of what was in the works at Ford and GM, it ordered all hands back to the drawing boards. The result is said to be a smaller car than the original, much more stylish, more competitive in price. More stylish, however, doesn't mean more geegaws and chrome. In fact, all the new subcompacts will go easy on bangles and baubles. Instead, automakers look to paste-on stripes, special paint schemes to impart customary new-car flash.

*(Please turn to page 16)*





# The DieHard won't get you away from it all, but it'll get you started

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Lying on a sun-drenched beach would be nice. But, at freezing temperatures in a blizzard, it's amazing what you'll settle for. Like getting to the drugstore or getting to work, or just getting home.

The DieHard was invented for just such swell times. It's got 35% more usable starting power than any other battery around.

Polypropylene made that possible. That's the name of the thin plastic case of the DieHard. This case is the same size on the outside but roomier on the inside. For bigger plates and more acid. You couldn't have squeezed all this extra power

into a rubber case, and yet this battery case is 6 times stronger than those used for conventional batteries.

If you just have to put up with bad winters, the DieHard will make good company. It's guaranteed for five long years. That's probably longer than you'll keep your car. So why wait? And remember, when Sears guarantees . . . Sears guarantees.

There are over 2500 places to buy the DieHard. They're all Sears, Roebuck and Co. stores. You can Charge It of course on your Sears Revolving Charge.

So maybe the DieHard can't get you to a warmer climate, but if it gets you to work on time, you can bask in the warmth of your boss's smile.

**The Sears 5-year guarantee:** "Free replacement within 90 days of purchase if battery proves defective. After 90 days we replace the battery, if defective and charge you only for the period of ownership, based on the regular price less trade-in at the time of return, prorated over number of months of guarantee."

The DieHard. Sold only at Sears. \$29.95 with trade-in. In Canada, at Simpsons-Sears at slightly higher prices.

**Sears**

**ALLSTATE**

You can't do better than Sears.

DieHard batteries now fit 97% of the cars on the road. Sears carries a complete line of other fine batteries as well, in a wide range of prices.

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# How to get rich

How can you get rich some day? Make a hit record . . . a killing on the stock market . . . or invent a gadget like the hula hoop?

For most of us, these are just dreams. But have you ever stopped to think that there is a way to get rich—possibly only one sure way? Most fortunes, as you know, are made by people who own their own business.

Perhaps you've thought of starting a small business of your own . . . a franchised drive-in, or maybe a service business. Trouble is, you need \$10,000 to \$15,000 to get started and even then it's a gamble—with slim chances of ever making really big money.

But there is *one* business which could make you rich—almost overnight! And the beauty of it is, you can start on a shoestring during your spare time, even while holding your regular job.

## Cash by Mail

The business is Mail Order—and it's fabulous! Come up with a 'hot' new item . . . and WHAM!

It strikes like a bolt of lightning!

Suddenly, you are deluged with cash orders from all over the country . . . MORE MONEY than you could ever make in a lifetime!

Like the Vermont dealer who ran one ad in Sports Afield Magazine. His ad pulled 22,000 orders—over A HALF MILLION DOLLARS IN CASH!

There is no other business where you can make a fortune so quickly!

● A beginner from Newark, N.J., ran his first small ad in House Beautiful—offering an auto clothes rack. Business Week reported that his ad brought in \$5,000 in orders. By the end of his first year in Mail Order, he had grossed over \$100,000!

● Another beginner—a lawyer from the midwest, sold an idea by mail to fishermen. Specialty Salesman Magazine reveals, "he made \$70,000 the first three months!"

## Proof

It's a fascinating business! Running ads in newspapers and magazines . . . mailing gift catalogs . . . getting cash orders in your daily mail—steady as clockwork.

There is no other business where you can start on a shoestring and pyramid your profits—without investing in merchandise! One husband and wife mail order team took in \$40,000 selling one item. They obtained FREE ads in national magazines . . . didn't invest a cent in merchandise, and even got the supplier to ship all orders for them!

These exceptional cases are absolute proof that *you can get rich* in your own Mail Order business. Very rich. Even a U.S. Gov. Report stated: "A number of

one-man Mail Order enterprises make up to \$50,000!"

Pick up any magazine. Notice how the same mail order ads are repeated . . . month after month? That's concrete proof! You know those ads wouldn't be repeated over and over again—*unless* they were bringing in big cash profits to their owners.

## The Secret

The secret of getting rich in Mail Order lies in *financial leverage*. It's a little-known, almost secret method—using other people's capital to make money for you!

You can get thousands of dollars worth of advertising in big national magazines—without investing your own money! And you don't have to write a single ad. Tested and proven ads are prepared for you by experts. Reinvest the profits from your first successful ad—to get more, larger ads, and the profits begin to snowball! It's like building a chain of stores . . . each new store puts more money in *your* pocket.

You mail out beautiful catalogs which offer hundreds of dollars worth of fine, quality gifts—yet you don't invest one



The thrill of receiving money in your mail is one you'll never tire of!

cent of *your* own money in merchandise! Your catalogs are printed with your name and address, so all orders come to you. Everything is "drop-shipped" for you, and there's up to 100% mark-up! You pocket the cash profits immediately—even before the orders are shipped to your customers!

Repeat orders alone, just from mailing catalogs, could bring you a steady income for the rest of your life!

Yes, Mail Order is the fastest-growing, most profitable business in America! And now, with more people moving to the suburbs . . . the population explosion . . . and the expanding teenage market . . . we are on the verge of the BIGGEST BOOM in Mail Order history!

Now, with the help and backing of Mail Order Associates, Inc., of Montvale, N.J., you can follow the same proven steps to Mail Order success—using the 'secret' of financial leverage!

## Start Now

We supply you with beautiful gift catalogs throughout the year. All products are dropshipped for you, with up to 100% mark-up! You get free samples of top-selling mail order items, plus monthly trade reports on 'hot' new products . . . tested, successful ads are sent to you monthly. You get advertising directories, postal laws, complete courses, expert guidance—**EVERYTHING** you need to practically guarantee **YOUR SUCCESS**. Why? Because *our* business depends upon your success. It's mutually profitable!

A recent feature article in Income Opportunities Magazine stated, "Mail Order Associates Inc., offers the most comprehensive Mail Order program ever offered to beginners." They go on to say, "This could be the opportunity you've been looking for. A chance to get in on the ground floor in a little-known business which we believe is on the verge of a new boom."

## Free

We are now accepting a limited number of charter members in our new Mail Order Program. No previous experience is required but you must be over 21.

If you are sincerely interested in starting a profitable business of your own . . . if you can see the tremendous advantages which Mail Order offers . . . then **ACT NOW!**

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will send you a free book—gift catalog, reprints of feature articles, plus complete facts about our program. Write to:

Mail Order Associates, Inc., Dept. 141  
Montvale, New Jersey 07645

### Rush Coupon for FREE BOOK!

plus reprints of  
Mail Order  
articles

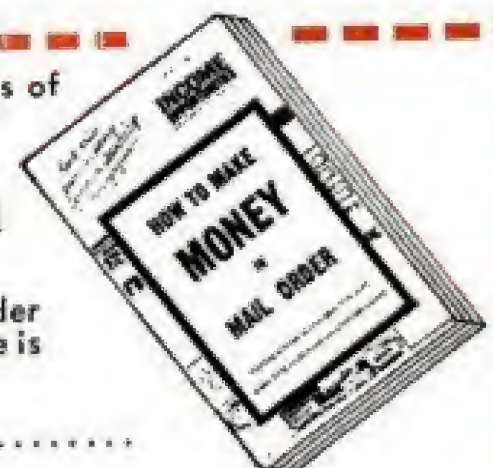
Mail Order Associates, Inc., Dept. 141  
Montvale, New Jersey 07645

Please rush complete details on your Mail Order Program. I understand everything is free and there is absolutely no obligation. I am over 21.

Name .....

Address .....

City ..... State ..... Zip .....





# My Wife and I started our own Anti-poverty program with this beat-up davenport— picked up for \$5—sold for \$300! Now that MUI taught us the secret, we'll never be poor or dependent again!

Better than \$10  
an hour for our time!

"I hate to think how many years I put in, slaving away at a dull, dead-end job. My wife and family were doing without the good things in life, while right at hand were opportunities for making money I never dreamed about. Now that we know upholstery, we know that every second-hand furniture store or thrift store—where they practically give away old, beat-up furniture—is a gold mine for us."



## UPHOLSTERY IS ON THE MOVE WITH AMERICA!

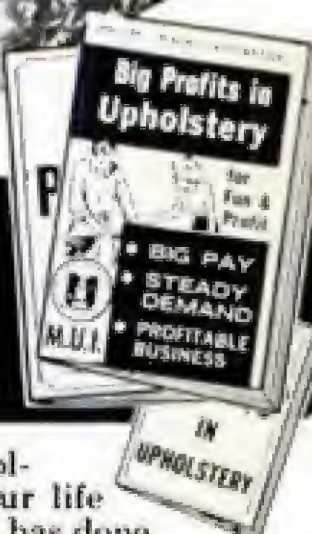
**JOIN THE GROUP—AND PROSPER!** Just open your eyes and look around you! Never in all American history has there been a boom to equal this one. New freeways, new buildings, new real estate developments, new homes, hotels, motels, restaurants, bars. Can you imagine how much **UPHOLSTERED FURNITURE** is required for all this? And can you imagine how much of it will be *worn out and need reupholstering!* America is on the move with campers, trailers, mobile homes, boats—and even these constantly need upholstery and re-upholstery! Autos—26 million of them on the road, millions in need of new re-upholstered seats, headliners, door panels! All this spells opportunity, security, independence, good hard cash in your pocket if you have the know-how to take advantage of this greatest of all booms. Don't let it pass you by!



**BUSINESS OF YOUR OWN! TOP PAY,  
AUTOMATION-PROOF JOB OPPORTUNITIES!**  
M.U.I. Step-by-step training qualifies you  
for jobs, or your own business, or both!  
**Husband-wife teams ideal!**

One of the great features about upholstery is that it takes so little capital to start. Many begin in their garage, doing small jobs for friends and neighbors. Then the word gets around and your own private "boom" begins. Many have far more work than they can handle in a few short months. To get started easily, the husband often stays on his job while the wife learns the easy MUI way. Or if you don't want your own business, check the Sunday classified ads. Industry is **CRYING** for skilled upholsterers **right now**. Top wages are offered. And the jobs are **AUTOMATION-PROOF!** Computers will never learn upholstery—but **YOU** can—quickly, easily, the practical, step-by-step, tried and proven MUI way!

**THIS FREE UPHOLSTERY CAREER  
BOOK & SAMPLE LESSON  
MAY BE THE MOST IMPORTANT  
LITERATURE YOU'LL EVER READ.**



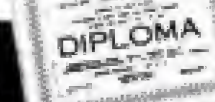
This free, illustrated 32-page upholstery career book may change your life in ways you can't even imagine! It has done so for others, thousands! It has taken low-pay men and women, all ages, regardless of education or experience, and has brought them up out of their workaday ruts and exposed them to the ways of prosperity, pleasure, independence, security, through **UPHOLSTERY**, the great boom business that is eager to share its **BILLIONS** with **YOU!** Send for **FREE BOOK & SAMPLE LESSON** today!

## UPHOLSTERY NEEDS YOU—YOU NEED UPHOLSTERY! AT LEAST SEND FOR THE FREE FACTS—YOU CAN'T LOSE—YOU MUST GAIN!

A simple act—just clipping and mailing the coupon in this ad—brings you the MUI 32-page illustrated career book, the free sample lesson and all free information about **UPHOLSTERY**, the automation-proof industry that has more to offer ambitious men and women today than ever before in history. Clip the coupon and mail it now! Start your own anti-poverty program!

MODERN UPHOLSTERY INSTITUTE, Box 899-BMM Orange, Calif. 92669

**IF YOU CAN'T BE A COLLEGE GRAD—AT LEAST  
EARN LIKE ONE.** Get this diploma—your passport to prosperity. We can't all go to college—but now, thanks to the progressive MUI training program, you can earn as much—**AND MORE**—than many college graduates. MUI is authorized by the California Superintendent of Public Instruction to issue a **DIPLOMA** in upholstery.



**AIRMAIL  
COUPON  
TODAY**

**BUILD A  
ROOMFUL OF FURNITURE  
WITH MUI'S 6 BIG KITS.  
KEEP IT—SELL IT—  
—PROFIT BY IT.**



**YOU LEARN AT HOME, IN SPARE TIME...  
YOU GET SIX TOP-QUALITY FURNITURE KITS  
AND FREE HAND TOOLS FOR PRACTICAL  
"LEARNING-BY-DOING" TRAINING.**



MODERN UPHOLSTERY INSTITUTE, Box 899-BMM  
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Please send the **FREE UPHOLSTERY CAREER  
BOOK**, the **FREE SAMPLE LESSON**. I understand I  
am under no obligation whatever and am just  
sending for the free facts on job and career oppor-  
tunities in Upholstery and the MUI home training  
program.

Name \_\_\_\_\_ Age \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**APPROVED FOR VETERANS**



## DETROIT LISTENING POST

(Continued from page 14)

**A SKID-RESISTANT ROAD SURFACE** that stands up to the wear and "polishing" caused by heavy traffic—long a goal of highway engineers—has been developed and tested in Britain. Nearly two years ago small chips of calcined bauxite were bonded with epoxy resin to conventional concrete and asphalt surfaces of seven of London's busiest intersections. Results indicate that bauxite resists "polishing," retains its skid-resistant qualities. More importantly, accidents at these particular junctions were reduced 70 percent in less than two years.

**AMERICAN MOTORS** brass reported pleased and proud of the record established by its Javelin in its first year of major-league racing competition. Entered in 12 of the 13-race Trans-American series run by the Sports Car Club of America (SCCA), one or the other of the two-car Javelin team finished second six times, third twice, fourth twice, and fifth four times. At least one Javelin finished all 12 of the races entered. Two-car team ran entire season with only seven engine blocks, a remarkable achievement when compared to the series' many Mustang and

Camaro entries, most of which seem to eat engines like salted peanuts. Principal Javelin drivers this past year were Peter Revson and George Follmer, both of whom are said to be signed up for the coming season.

**FRANCE'S RECENT MONEY CRISIS**, and the steps taken by international monetary authorities to resolve it, has—among other things—boosted list prices of Volkswagens in the U.S. In shoring up the sagging franc, the West German government slapped a four percent tax on exports in an effort to cut its highly favorable trade balance. The result is that the popular "Beetle" sedan, for example, is now \$1799 at East and Gulf Coast ports of entry, an increase of \$50. Other increases throughout the VW line range upward to a maximum of \$71 for the "Squareback" sedan. All this, of course, points to an interesting and possibly lively situation: Here's VW, forced to jack the price of its cars, particularly the Beetle, just as Detroit is launching an all-out competitive effort, the opening round of which will be April's introduction of Ford's Maverick. That \$1799 list price is perilously close to \$1800, and in view of Ford's intention to price the Maverick "well under \$2,000," the sales battle could be intense. ★★



What's the Gilson S-12 got that other tractors haven't?

# Plenty!

That's because the S-12 was designed and built from scratch to lead the field.

No souped up last year's model, this one. Rugged 12 hp design starts with a specially contoured frame that's high in the back for good visibility and nipped in at the middle so you practically ride in it, not on it. More, the

frame cradles the engine to form a single, rock-solid unit. There's direct drive from the engine to the transaxle. And a new variable speed control that keeps engine torque high so implements run at peak efficiency in any one of four speed ranges. Plus one convenient PTO point for all attachments. Of course, you also get grouped controls, big, fat, turf-saving tires, padded bucket seat, hydraulic implement lift, full-fledged auto battery and much more. Both 12 hp and 10 hp models team up with a full line of attachments. See your Gilson dealer for a demonstration, or write direct for catalog and your *free* copy of "Gilson Tips for Lawn & Garden Care."

**Gilson®** BROTHERS COMPANY, BOX 152, PLYMOUTH, WIS. 53073





### Transistorized TWO STATION INTERCOM

Switch on and talk! No complicated connections. With 66 feet connecting wire. **SET \$2<sup>85</sup>**

### 8mm MOVIE CAMERA

Electric powered—no winding! Detachable pistol grip. Loads in seconds. Adjustable lens. Black and white or color. **\$5<sup>50</sup>**



### Transistor TAPE RECORDER

Records—Plays Back—Erases—Rewinds. Includes dynamic speaker, microphone, tape, reels, etc.

**\$4<sup>95</sup>**



### ELECTRIC RAZOR

Product of Swiss Craftsmanship. Shaped to shave heaviest beard. Maker guarantees for one full year. With cord, head guard and brush. **\$1<sup>70</sup>**

### DUTCH MOTOR- CYCLE

**\$113<sup>00</sup>**



Double tubular racing frame. Complete with buddy seat, chrome panels, lock, claxon, tools, speedometer. Deluxe Sprintmaster model for sporty appeal.



### FIELD GLASSES

7x35 G.C.F.

7x35 G.C.F. Clear and powerful. Beautifully balanced. Very lightweight, protective lens cover, center focusing. **\$2<sup>40</sup>**

**VOLKSWAGEN \$955** Good used buys too. 1 yr. old Volkswagen \$1080 2 yr. old \$955 others low as \$400. Guaranteed.



More examples of thousands of import bargains you can get to make fantastic profits up to 200% and more.

FISHING ROD	.50
FM HI-FI RADIO	8.80
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FLASHLIGHT	.10
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CARDIGAN SWEATER	2.00
SPINNING REEL	.96
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WRIST RADIO	2.90
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Prices subject to availability, price fluctuation.

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Import bargains by the thousands give you profit opportunities beyond your wildest dreams. Men—women start now in your own Home Import Business, full or part time. Cash in now without previous experience or capital investment. You can make your first import order 10 minutes after you get my proven drop ship plan. These bargains and thousands more go quick to stores, mail order operators, premium users, friends, others.

## DISCOVER SECRETS OF IMPORT The Profits are All Yours!

Plan reveals everything to start you importing immediately. Gives you free membership in International Traders—famous world wide organization that puts you in direct contact with suppliers abroad. It's easy to buy below wholesale when we show you how. Rush coupon today for my FREE BOOK, "How to Import and Export"—get details about thousands of amazing buys. Airmail reaches me overnight.



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Do Not Order From Us. I show you how to get these bargains and hundreds of others. Prices shown are direct from suppliers abroad.

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in mail today!

Get details on 8 FREE Imports

### 30-POWER TELESCOPE & TRIPOD

Sturdy Metal  
Construction



3 section  
Telescope lets  
you see farther.  
Extends for  
razor-sharp  
focus.

**\$1<sup>94</sup>**

### JEEP

Great surplus buys available also. Austin Jeep with Rolls-Royce engine.

**\$346<sup>00</sup>**



### CALENDAR WATCH

Swiss movement. Beautiful styling. Tells time and date. Sweep second hand, gift case, stainless steel back, water resistant, antimagnetic. METAL

**\$2<sup>33</sup>** EXPANSION  
BAND 11¢.



### REAL SAPPHIRE RING

Hand set Sapphire Stone in Sterling Silver mounting. Smart design. Ladies styles also available.

**3<sup>50</sup>**



### HUMAN HAIR WIG

Exciting new craze! Glamour high fashion wigs. Popular hair colors. Skillfully made. Luxuriously soft; fine textured.

**\$9<sup>10</sup>**



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IMPORT  
AND  
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FREE BOOK TELLS HOW  
TO MAKE MONEY IN IMPORT

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Send Free Book showing how I can start a business of my own and make big profits. Show me how I can get bargains like these, how to buy below wholesale. (If under 21, state age.)

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State \_\_\_\_\_ Zip Code \_\_\_\_\_

Save 3 days... Give Zip No. for fastest reply.

IF POST CARD HAS BEEN REMOVED. PLEASE RUSH COUPON



# **Science Worldwide** BY JOHN F. PEARSON

Best treatment for some cases of ulcers, hypertension, migraine headaches, asthma and other so-called psychosomatic ailments is a regular pattern of sound sleep. So says University of Southern California's Dr. Leon Marder, who successfully treated 12 patients suffering from various ills. Drugs were used to keep the patients asleep 18 to 20 hours a day for two weeks. They were awakened three times a day for meals, light exercise and psychiatric consultations. But it's the quality, not the quantity, of sleep that counts, says Dr. Marder. The patients had been getting little or no "stage four" sleep, the deepest phase, before they became ill. It has been established that a lack of stage-four sleep can eventually cause humans to become psychotic.

A computer is helping drivers in the Houston, Tex., area by letting them know when it's safe to enter the flow of traffic on the Gulf Freeway. Detectors along a 6½-mile section of the freeway report the speed and distance of an oncoming car to a computer. The machine compares this information with factors relating to a car about to enter highway traffic—its acceleration capability and the length of the access ramp. If the computer finds that the safety gap between the two cars is adequate, it actuates a green light for the car waiting on the ramp.

Savor every mouthful if you get the chance to munch a Spijon or a Jonagold. They're new varieties of apple and their development took more than 20 years at the New York State Agricultural Experiment Station at Geneva. The Spijon, 3¼ inches in diameter and dark crimson in color, was developed from a Red Spy and a Monroe; the Jonagold, 3½ inches around the middle with red striping over a yellow background, has the Golden Delicious and the Jonathan as its progenitors. Researchers say the new apples are firm, juicy and delicious. Footnote: 57 varieties of apple have been developed by the Experiment Station since it was opened in 1882.

Factories in space are being considered by NASA theoreticians, according to Dr. George E. Mueller, associate administrator for Manned Space Flight. Weightlessness would make possible the manufacture of nearly perfect ball bearings, according to Dr. Mueller, because "liquid floating in a weightless environment takes the shape of a perfect sphere. It is conceivable that metal ball bearings could be manufactured in space to tolerances impossible on earth." In machinery, perfect ball bearings would reduce friction and noise levels almost to the vanishing point. Other improved products might include flawless optical blanks for telescopes and foamed structural steels almost as light as balsa wood.

Camelot, legendary court of King Arthur, is the object of a search by archeologists at a site in South Cadbury, England. Because the area has been occupied for about 4000 years, it is confusingly rich in ancient remains, requiring the use of a computer and other hardware to help sort out clues. Sensing instruments—proton magnetometers—act like modern witching rods as they read out underground shapes in the form of dot density patterns. (A proton magnetometer measures the earth's magnetic field, which is modified by buried pits, ditches, kilns, hearths and the like. So far, it seems, Camelot still is located only in the realm of legend.

A rabbit has been turned into a living battery by researchers at a General Electric lab. Two dissimilar metallic electrodes were implanted in the 3-pound rabbit's body. Galvanic action produced electricity (much as it does in an ordinary battery) sufficient to power an implanted transmitter that broadcasts the rabbit's heartbeats. One application in humans would be the operation of implanted artificial organs and devices for long periods of time. The tiny batteries now used to power heart pacemakers have a limited life and have to be replaced under surgery. ★ ★ ★





### "FISH" WITH A MAGNET

Go treasure hunting on the bottom! Great idea! Fascinating fun and sometimes tremendously profitable! Tie a line to this powerful, but lightweight Magnet—drop it overboard in bay, river, lake or ocean. Troll along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle—all kinds of metal valuables. Specially designed horseshoe-shaped with  $3\frac{1}{8}$ " sq. gripping surface. Tremendous lifting power—over 150 lbs. on land, much more under water.

NO. 71,135H...150 LB. PULL...\$12.50 PPD.  
NO. 71,134H...75 LB. PULL...\$6.50 PPD.



### MODEL DIGITAL COMPUTER

Solve problems, teach logic, play games with miniature version of giant electronic brains! Adds, subtracts, multiplies, shifts, complements, carries, memorizes, counts, compares, sequences. Colored plastic parts easily assembled.  $12" \times 3\frac{1}{2}" \times 4\frac{3}{4}"$ . Incl. step-by-step assembly diagrams, 32-page instruction book covering operation, computer language (binary system) programming, problems and 15 experiments.

Stock No. 70,683H .....\$5.98 Ppd.  
**BIG NEW DIGICOMP II!**  
Stock No. 70,946H.....\$16.00 Ppd.



### PLASTIC MODEL V-8 ENGINE

Hours of fun! Get thrill of building your own easily assembled engine from over 350 parts. Then push starter and watch it run. Crankshaft revolves, pistons move, valves open and close in sequence with spark plugs. Does everything but burn oil.  $\frac{1}{4}$  scale molded in 4 colors. Same motor used in many auto-mechanic courses. Excellent, easy-to-understand "tech manual".

Stock No. 70,448H .....\$12.95 Ppd.



### AMER. MADE OPAQUE PROJECTOR

Projects illustrations up to  $3" \times 3\frac{1}{2}"$ —enlarges them to  $35" \times 30"$  if screen is  $6\frac{1}{2}$  ft. from projector, larger if screen further away. No film or negatives needed. Projects charts, diagrams, color, black-and-white. 115 V A.C. Operates on 60 W bulb, not incl.  $12" \times 8" \times 4\frac{1}{2}"$ . 1 lb. 2 ozs. Plastic case.

Stock No. 70,199H .....\$7.95 Ppd.



### NEW! PROJECTION KALEIDOSCOPE

At last—a low-cost unit complete with 9" diam. liquid wheel. Projects infinite variety of brilliant color patterns which **do not repeat**. Specially designed wheel, 3" projection lens and Edmund Visual Special Effects Projector make it all possible. Easily operated. Large screen image at short projection distance perfect for photo backgrounds, light shows, parties, dances, etc. Front or rear projection. Incl: 1 RPM 115V Motor, motor bracket, instructions.

Stock No. 71,121H .....\$94.50 Postpaid  
**SOLID MULTI-COLORED GLASS ACCESSORY WHEEL**

Stock No. 71,122H.(9" Diam.)..\$15.00 Ppd.



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THE SPACE AGE!**

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**for Fun • Study • Profit  
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### 3" ASTRONOMICAL TELESCOPE

See the stars, moon, phases of Venus, planets close up. 60 to 180 power. Aluminized and overcoated 3" diameter f/10 primary mirror, ventilated cell. Equatorial mount with locks on both axes. Equipped with 60X eyepiece and mounted Barlow lens. 3X finder telescope, hardwood tripod. Includes "STAR CHART"; 272-page "HANDBOOK"; "HOW TO USE TELESCOPE" book.

Stock No. 85,050H .....\$29.95 Ppd.

Stock No. 85,105H...4 $\frac{1}{4}"$ ...\$84.50 f.o.b.

Stock No. 85,086H...(6")...\$199.50 f.o.b.



### DIAGNOSE MECHANICAL TROUBLE

Professional Stethoscope. Designed for use by physicians, this super-sensitive Stethoscope is ideally suited for detecting faults in machines and engines, and in fluid, air and gas leakage. Dozens of uses in auto repair shops, labs and for hobby and educational applications.

Stock No. 50,270H .....\$7.50 Ppd.

**BARGAIN PRICE STETHOSCOPE**

Stock No. 50,223H .....\$3.25 Ppd.



### WOODEN SOLID PUZZLES

Here's a fascinating assortment of 12 different puzzles to provide hours of pleasure and stimulate ability to think and reason. Animals and geometric forms. Take them apart and reassemble them. Lots of fun for the whole family—young and old. Will test skill, patience and ability to solve problems. Order yours now.

Stock No. 70,205H.....\$4.00 Ppd.



### FLY 9-FT. HOT AIR BALLOON

9 Ft. tall. Rises to amazing heights on just hot air. Tether attached, can be used repeatedly. Easy to make, launch, fly, loads of fun. Great for celebrations, science fairs, plain fun. Will lift model gliders, parachutes, instruments, etc.—anything up to  $\frac{1}{2}$  lb. Approx. 5 ft. diam. when fully inflated. Kit contains 10 pre-cut red & white gores (No. 1 model paper), 6 ft. 14-gage wire for bottom ring, top, "tie-off" cord, complete instructions.

Stock No. 60,691H.....\$2.00 Ppd.



### GIANT WEATHER BALLOONS

"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed and temp. Heavy duty neoprene. Inflate with vacuum cleaner or auto air hose; or locally available helium for high rise.

Stock No. 60,568H....8'.....\$2.00 Ppd.

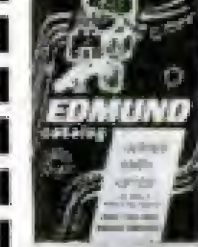
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My car is a \_\_\_\_\_ (year) \_\_\_\_\_ (model)

Engine displacement \_\_\_\_\_ Horsepower \_\_\_\_\_

Power Steering \_\_\_\_\_ yes \_\_\_\_\_ no

Floor shift \_\_\_\_\_ Steering column shift \_\_\_\_\_

Smog pump \_\_\_\_\_ yes \_\_\_\_\_ no

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- ✓ To adjust for mathematically correct carburetor adjustment and thus insure maximum gas economy and

quiet engine running, simply use the Tachometer section of the Model BT-162. Read the exact RPM while the engine is in neutral position. Then adjust the carburetor in conformity with the car manufacturer's recommendations as specified in the manual provided with the Model BT-162.

- ✓ To locate a "miss" you need only disconnect or "short" the spark plugs one at a time with the Model BT-162 switched to the Tachometer position. You will be able to instantly identify which particular plug (or frequently its wire lead) is responsible for the malfunction.
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☐ Save Money! Check here and enclose \$29.95 with this coupon and we will pay all shipping charges. You still retain the privilege of returning after 10 day trial for full refund.



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Cincinnati, Ohio 45212



I can meet initial cash requirement of \$12,000 and a good credit rating for a franchised One Hour Martinizing store. Please send me full particulars on the franchise program. Without obligation, of course.

Name\_\_\_\_\_

Street\_\_\_\_\_

City\_\_\_\_\_State\_\_\_\_\_

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# **This coupon will bring you the full story of a business described by many as "Dollar-for-Dollar, the best franchise opportunity today."**

You'll learn about ONE HOUR MARTINIZING—the best known name in dry cleaning—and a unique business system that's brought INDEPENDENCE and outstanding FINANCIAL GAIN to the owners of nearly 3000 stores. It can do the same for you!

The MARTINIZING story shows how you can share in a business where the American Public spends nearly 1½ BILLION DOLLARS ANNUALLY on dry cleaning alone. This figure grows each year, regardless of business conditions. So does MARTINIZING!

You'll see how MARTINIZING offers you a stable business that is built on the principles of CASH & CARRY, NO CREDIT, NO INVENTORY, NO DELIVERY. Requires only a minimum number of employees. Here's simplicity itself. Isn't that what you want?

EXCELLENT INCOME POTENTIAL! You'll also get an insight to the exceptionally good income that can be realized with ONE HOUR MARTINIZING. Following recommended procedures, owners should gross about 20% to 25% profit on sales. (We don't take a percentage of your sales or profits—or force you to buy supplies from us). Many people expand to profitable ownership of several stores in just a few years.

RUN THE BUSINESS? NOT ME. If you are interested in absentee management only, your Martin sales dealer will assist you in finding good managers. You'll come to agree with one Martinizing owner who says, "It's the best franchised business today as far as earnings potential versus initial investment."

WATCH TV, HEAR RADIO, SEE MAGAZINES? Then you've probably seen one of our ads—part of dry cleaning's largest year 'round program of CONSUMER ADVERTISING that has made MARTINIZING the best known name in dry cleaning. This sales building program can work for you.

WHAT'S THE HITCH? We don't think you'll find one. We have 20 years experience putting people into business (and keeping them there). Our parent company, McGraw-Edison, is one of the nation's top corporations. If you have a good credit rating and about \$12,000 as an initial cash requirement (covering down payment, installation and estimated starting expenses) then we have something to offer you right now that may well be your "Key To Success." Find out!

MARTIN SALES, 2005 Ross Ave., Dept. PM-269, Cincinnati, Ohio 45212.

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**"MARTINIZING"**  
CERTIFIES  
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**W**HEN Milton Aronoff turns around from the battery of 12 big deep-frying machines in his Chicken Delight shop in Fair Lawn, N. J., he can see them matched by rows of nearly as many smart-looking delivery trucks parked outside, waiting to carry orders right to customers' doors. Physically, Milt's shop is small—just big enough for the machines, himself, and a couple of helpers. What isn't small about this bustling franchised business is that it nets him around \$30,000 a year.

When he graduated from high school in nearby Paterson about 10 years ago, Milt went to work in a linen supply business, making about \$6000 a year. Then he heard about Chicken Delight. At that time, a franchise to sell these fresh-cooked, carry-out foods cost \$15,000, half of which had to be in cash. Milt borrowed what he needed and the Chicken Delight people did the rest. They built him a shop on busy Route 4, supplied him with cooking equipment, and even trained him. Within a couple of years, he repaid all he owed on his franchise, and he and his family moved into a handsome new home.

Today, Milt's business is really rolling—and so is Chicken Delight. The company now has about 1000 outlets coast-to-coast, and the cost of a franchise is up to \$30,000. The operation has been streamlined for maximum efficiency. Milt's suppliers send him chicken, shrimp, fish, loin ribs and potatoes all cut up ready for frying. This saves valuable preparation time since most of Milt's business comes in the hectic time between 4:30 and 7:30 in the evening. His stable of delivery trucks is equipped with heaters to keep customers' orders hot en route.

The big thing about a franchised business, aside from making you your own boss, is that you are buying into a going operation with an advertised name and a respected reputation. Right away, you become a member of an estab-

# How to Be Your Own Boss:

## The \$80-Billion Boom In Franchising

Every year, thousands who dreamed of running their own businesses are finding that dream coming true. From ice-cream stands to auto-service shops, opportunities in owner-managed franchises are almost endless—and so are the profits for anyone really eager

By CREIGHTON PEET



**FUTURE PROPRIETORS** of Dunkin' Donuts shops go to school at Newton, Mass., to learn proper cooking and business practices. Graduates earn as much as \$25,000 to \$35,000 a year







**KEEPING THINGS RUNNING** is vital to the success of an equipment-rental shop. Here, trainees for an A to Z Rental franchise, one of the biggest in the country, are taught proper power-mower maintenance

lished, experienced team. The parent company is just as anxious to have you be successful as you are—it won't make any money unless you do.

In most cases, the "franchisor"—the company that grants the franchise—helps you decide where to locate, gives you an exclusive right to sell his product in that area, trains you in good business practices and helps you get started. If you get into a jam, he's in a position to give you wise advice based on the experiences of thousands of others handling the same product or service.

This special relationship between the franchisor and you as the franchisee gives you an edge in starting a business. Proponents of the system take pride in pointing out that failure rates for franchised businesses are as low as three to five percent.

**FRANCHISED CAMPSITES**, one of newest ideas, provide tents, platforms and recreational facilities for campers. Safari Camps of Columbia, Mo., estimates a seasonal profit of \$21,830 for typical 100-site camp

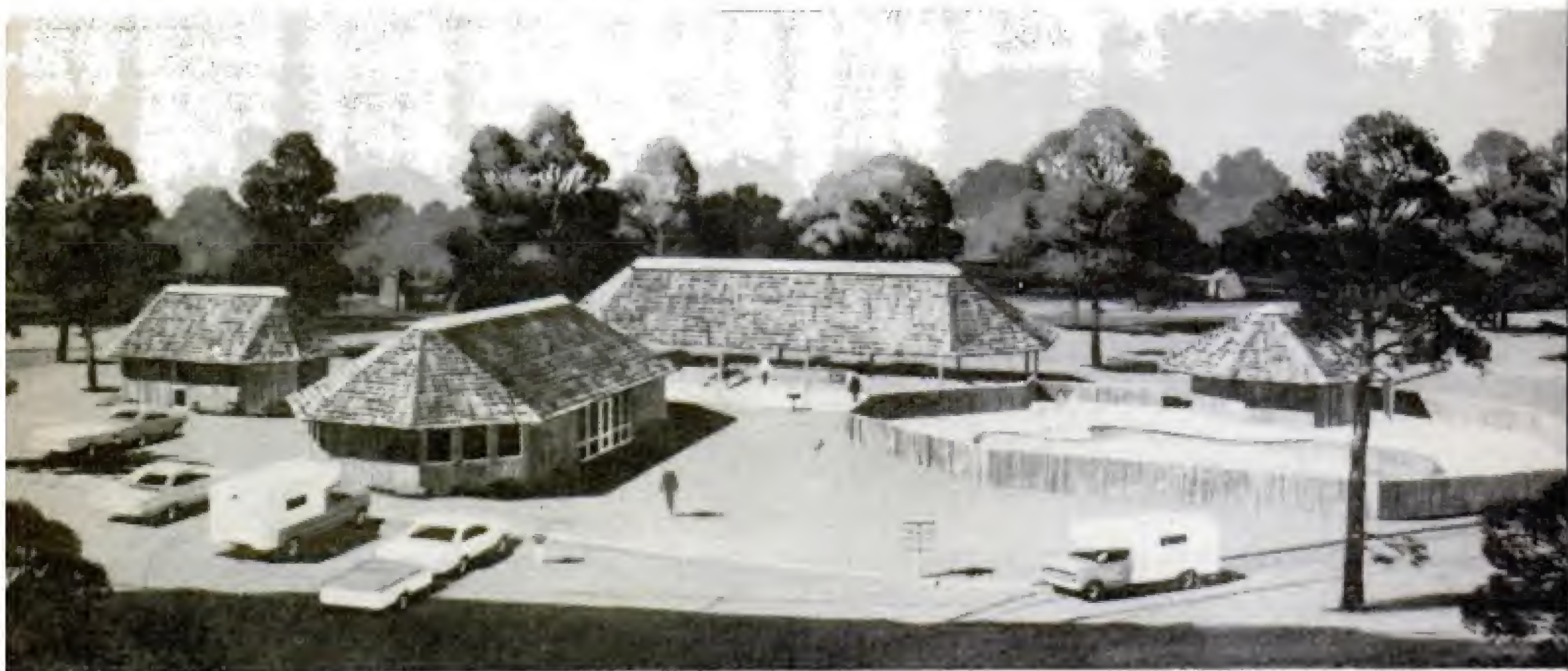


**YOU DON'T HAVE TO BE A MECHANIC** to apply for a Rayco Auto Center. Franchise includes training in all phases of auto service. Typical cash investment: \$30,000. Profits range up to \$66,000 a year

Failure rates for nonfranchised businesses range from an average of 20 percent to as high as 27 percent for food-serving operations. Moreover, if you *should* fail or want to get out of the business for some reason, a franchisor will often help you find a new owner to take over so you don't get stuck with a total loss.

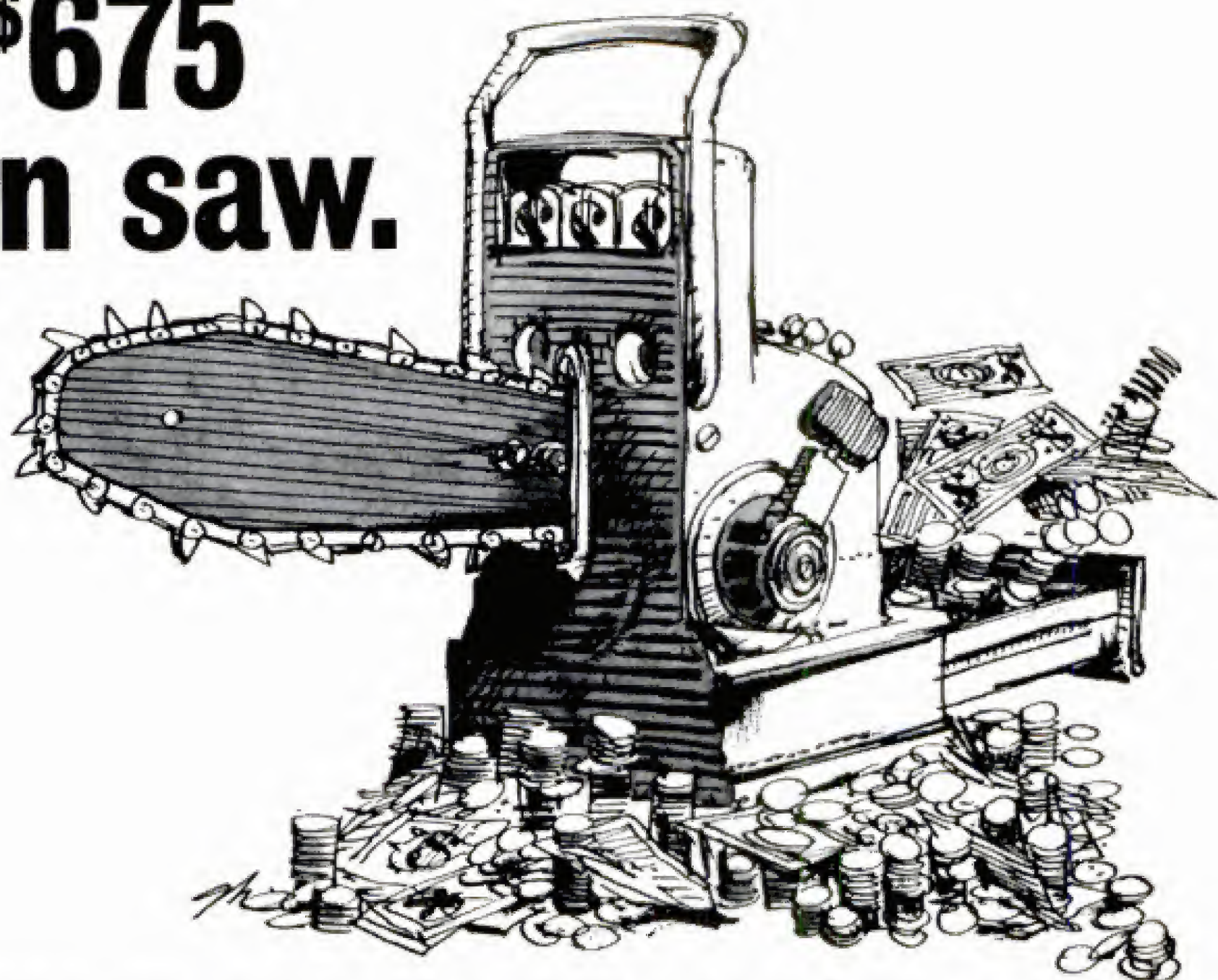
The franchise business is booming. What started mainly as an aid to job-hungry GIs returning from World War II has now mushroomed into a major American industry. An estimated \$80 billion worth of goods and services are sold through franchises every year—approximately 10 percent of the country's total economic output.

A lot of the smaller family-owned franchises are in food-serving businesses of one type or another—places like Milt's





# The \$675 chain saw.



Cut yourself in. Of all service businesses, the rental business will be the real growth one in the 1970's and beyond. Every business publication predicts this. Americans nowadays are more affluent, more mobile, less tied to possessions. They can afford to rent things, and they prefer to. Party goods, exercise machines, baby furniture, gardening equipment, power tools, sickroom items, you name it. Every item is high-profit...makes money for you even when your rental mart is closed for the night. Example: In a typical mart, a chain saw is rented 37 times a year, yielding \$675 in rentals.

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Robert Feinstein, Franchise Director  
United Rent-All, Inc.  
10131 National Boulevard, Dept. PM-2  
Los Angeles, California 90034

Name

Address

City  State

Zip  Phone





**FAMILIAR** Midas Muffler shops are seen in many areas and offer a number of franchise possibilities. Like Rayco, they provide variety of automotive services but do not require that a prospective franchisee be an automotive expert. Similar opportunities can be found in the well-known Lee Myles chain—a system of franchised shops that specialize in overhauling and rebuilding automotive transmissions. Actual in-shop training is provided for all franchisees in auto service

Chicken Delight, hamburger drive-ins, pancake houses, doughnut shops, ice-cream stands and the like. In addition to these, there is a staggering variety of nonfood operations ranging from equipment rental centers and auto-service shops to golf driving ranges, franchised campsites and coin-operated laundry services. You can even start a nightclub on a franchise.

How much you need to start a franchised business of your own may vary all the way from \$50 to \$50,000 depending on the type of operation, the location, whether you work out of your own home or need a separate building, and other factors. For a typical roadside establishment, you'd probably need from \$8000 to \$25,000 in cash. Many franchises, however, run to considerably less where all you do is buy or lease certain equipment.

Take Ronald J. Bonomo of Traverse City, Mich., for example. He's making a very good thing out of a Duraclean franchise for cleaning upholstery and carpets. Bonomo found himself pushed into the business when the factory where he was working for \$90 a week laid off all hands for an indefinite period. Reluctantly, he borrowed \$1500, bought the cleaning franchise, and right away it worked magic. Within a couple of days, he landed a job cleaning carpets for a motel for \$384. Now he's netting around \$12,000 a year, mainly on large commercial cleaning jobs.

For Harris Eisner, the big change in his life came when a cousin told him about something called Lawn-A-Mat, a tractor-like machine that sprays, seeds and rolls lawns all at once, doing a day's work for 10 men in 15 minutes. With loans from relatives and savings, Eisner bought a Lawn-A-Mat franchise for \$9500 and went into business in Mount Vernon, N.Y. He can service 10 to 12 lawns a day with the machine and is netting \$15,000 to \$20,000 a year.

Here are the prices for a few other typi-

cal franchises: Grout Lock, a new cinder-block construction material is \$5500. Roto-Rooter, a device for cleaning drains and cesspools, is \$6000. A Western Auto Supplies outlet goes for \$14,000; a Mary Carter paint store for \$15,000. Car-washing installations are a big thing this year and come in all sizes from Washmobile's coin-operated self-service setups for \$1695 to much more elaborate Wash & Waxmobile setups with wrap-around rotary brushes



**THIS ONE-HOUR DRY CLEANING SERVICE**, known as "Martinizing," is based on a franchised process. While exact profits aren't made public, yearly incomes in five figures are said to be common

costing \$20,000, with a cash outlay of \$10,000.

Franchising provides a manufacturer with direct consumer outlets, entirely bypassing the middleman. Some of this reduced operating cost is passed on to the franchisee. Since the franchisor buys in tremendous quantities and has no middleman expense, he can afford to give you the benefit of lower prices on the supplies you buy from him.

Don't, however, get the idea that a franchise is an easy way to get rich quick. It isn't. Developing a franchised business, like any new venture, requires long hours,



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FRANCHISE SALES DEPT.**

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PLEASE SEND COMPLETE  
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hard work, initiative and self-sacrifice. Milton Aronoff still puts in an 11-hour day at his Chicken Delight shop, working from noon until almost midnight. In the early years, he worked even longer hours and his wife helped out, too, taking orders and keeping the books.

There are generally no hours in a small family-run business—you work as long as there is work to do. The more time and effort you're willing to put in, the more profit you usually get out. Also, you must



**COMMERCIAL CLEANING BUSINESS** requires relatively small investment in rug and upholstery shampoo machines. You buy the equipment outright and keep all you earn in Von Schrader system of Racine, Wis.

**TWO MILLION HAMBURGERS A DAY** are consumed by hungry motorists who stop at McDonald's roadside stands across the country. One of the best-known franchised food chains, it insists on careful pre-training and stiff quality controls. Average net income before taxes: between \$50,000 and \$60,000



be willing to accept the identity of your franchisor and abide by his rules and policies. In this respect, you are not entirely your own boss.

You cannot, for instance, handle a competing product, and you will usually have to purchase all or most of your supplies from your parent company. Prices, quantities, even the architectural design and decorative motif of your shop, will be established by the franchisor. In most cases, you will be expected to pay back to the franchisor a royalty charge of three to five percent or more off your gross revenue every year.

The easily recognizable identity, the established reputation and the rigid controls all work to your ultimate benefit, but you have to have the right personality to fit into a franchised operation. Not everybody can. Here are some other helpful tips to bear in mind when you're looking for franchise opportunities:

Don't take on an operation involving more money than you have or can borrow comfortably. It may be a while before your project gets rolling and if you are



**SPECIAL VAN** travels around spray-washing buildings, statues—anything needing cleaning. The Instant Mobile Powerwash Service is franchise offered by Franchises International, White Plains, N. Y.



# 3 WAYS to a profitable business of your own

—and only—

## VON SCHRADER HAS ALL 3

Von Schrader is the oldest and largest company making Detergers of this type. For over 30 years our FREE ENTERPRISE PLAN has been fashioned with your future in mind. Start with the Deterger that most appeals to you. We have thousands of Associates who have built successful businesses with just one Deterger. Naturally, bigger and more profitable businesses can be built when you are able to offer two or all three cleaning services.

### For example, let's say you start with the **VON SCHRADER WALL DETERGER** (LOWEST PRICE OF ALL THREE)

1 • Associate G. H. Jones made \$1200.00 on one job. Associate R. G. Fullmer says contracts this year will gross about \$18,000.00. And no wonder...this machine washes walls 6 times faster than by hand...with no mess...no drop cloths needed. Washing is so easy...no tiresome scrubbing...special glider wipes walls clean with little effort. You can start part-time and by working week-ends add hundreds of dollars to your income while still employed.

### Then you can double your profit by adding the **VON SCHRADER UPHOLSTERY DETERGER**

2 • Associate Charles Lemmin averaged \$100.00 a day during his first year. Associate Peter Young took in \$960.00 last week. You clean upholstered furniture on customers' premises—homes, hotels, motels, etc....even auto upholstery. No hauling...operate from your home. Watch business grow as customers tell their friends.

And, finally, you can more than triple your profits by adding the

### **VON SCHRADER RUG DETERGER** because each service helps to sell the other two

3 • Associate C. E. Nevin reports he averaged \$1000.00 a month for 12 months. An Associate father-son team grossed \$33,000.00 their first year. Von Schrader's FREE ENTERPRISE PLAN is not a lease arrangement. You sign no contract. You own the equipment. You pay no fees, dues or royalties to anyone. Every dollar you take in is yours to keep.

Full Operating Instructions come with each Deterger... you need no special skill or training. And our Business Manual tells everything you need to know about getting business, suggested sales letters, tips on keeping books and tax records, suggested ads and radio announcements, etc. Our assistance is always at your service. Training and consulting with experts is also available...and without charge.

**Don't Delay...** it costs nothing to get the details. Return the coupon **TODAY** for informative **FREE** booklet. Be sure to check the Deterger you are most interested in starting with.

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and how I can start my own profitable business.

Name \_\_\_\_\_

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saddled with excessive payments, you may fail before you're really started. You should have enough capital to operate for at least five to six weeks without much money coming in.

Investigate the local franchise you are considering thoroughly. Check it out with the local Better Business Bureau, Chamber of Commerce and any businessmen you know.

Check over, on your own, what the company representative has told you about his franchise. Has he exaggerated or perhaps painted too rosy a picture? Visit other holders of franchises for this same product in nearby towns. Talk to them. How do they seem to be making out? Have they any gripes? Do customers seem to like this product or service?

Visit the store or office location you are considering. If you are going to rely on drop-in customers, clock the number of people passing at different times of the day and days of the week. Do they look prosperous?

From your prospective franchisor get a clear picture of your financial obligations. When he says you need only so much cash, is this really all or are there unexpected extras? Are they counting on your using your own car or truck for deliveries or pickups? This may be all right, but be sure you understand all the details before you sign up. And when you do, get a lawyer to check over your agreement.

Think a long time before you get into a field you know nothing about. This doesn't mean you shouldn't try something entirely new to you. But if you do, be

**AN INSTANT SUCCESS**, Henry Vierra made a profit of \$18,000 in his first year of operating a Mister Donut shop in Waltham, Mass. Franchises cost \$25,000 to \$30,000, but to encourage expansion, company will permit a successful operator to start a second shop for as little as half



**FRANCHISED DEALERS** for Beltone hearing aids can work out of an office or their own homes. Using a portable electronic audiometer, they often visit customers' homes in person to test hearing acuity

**ROLLING GRASS FACTORY** seeds, fertilizers, rolls, aerates and kills weeds and bugs in one operation. Available on a franchise from Auto-Lawn, Matawan, N.J., it gives owner nine-month lawn-care business



sure you have talents that can be adapted to this new work. Everything is so specialized today that only a fairly young man can switch very easily.

Another thing to consider when you are buying a franchise is how your wife feels about it. She probably will have to help you man the telephone and keep the records. The business of bookkeeping is extremely important, not only because you want to keep track of your business, but because your franchisor will require periodic financial statements. Some companies insist that their franchisees hire a bookkeeping service if they are weak in this



## In What Business of Your Own Can You **MAKE BACK YOUR INITIAL INVESTMENT** in as little as **TWO WEEKS?**

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The initial investment in a Merlite Presto Shine Dealership is so modest, and the earnings you can make are so surprisingly high, that it's possible for you to earn back your initial investment in as little as 2 to 4 weeks! How many other business opportunities permit you to recoup so quickly?

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**SIMONIZ PASTE WAX JOB** FOR ONLY

When you're a Merlite Presto Shine Dealer, the equipment which we supply you and the system which we teach you, enable you to clean, wax and polish a car with genuine Simoniz Paste Wax in as little as 20 minutes! You charge only \$5.95 for this genuine Simoniz wax job—about 1/3 the usual professional charge. Yet you make up to \$5.75 gross profit on every car! Weekly gross profit up to \$500.00 and more is possible—as much as \$25,000-\$30,000 in a year!

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You get authorized use of patented HM Polishing Machine (U.S. Patent No. 2,967,315), which amazingly duplicates the motion of the human hand, enables you to start with a dirty car and bring it to a lustrous, gleaming, protected Simoniz Wax finish within as little as 20 minutes!

#### **2. PERSONAL TRAINING IN YOUR AREA WITHOUT A PENNY OF RISK!**

Even before you decide to become a Merlite Presto Shine Dealer, we will send one of our skilled Instructors to train you in the use of the HM Polishing Machine and the astonishing Merlite Presto Shine speed method. So easy, even a child can do it, after a little training! After your personal instruction, if you decide not to become a Merlite Presto Shine Dealer, you're not out a penny! You take no risk!

#### **3. PRACTICALLY NO OVERHEAD . . . YOU CAN WORK FROM YOUR HOME.**

The HM Polishing Machine operates on ordinary house current, so you can do all the work right at your home, if you wish, and save overhead expenses. Supplies and materials cost you about 20¢ per car, so your gross profit on a \$5.95 Simoniz Wax job is approximately \$5.75!

#### **4. START IN YOUR SPARE TIME.**

Many of our most successful Merlite Presto Shine Dealers held on to their full-time jobs, started out in spare time—evenings and weekends. Then, when they saw how much more money per hour they were making with Merlite Presto Shine, they went into full-time business of their own, and stopped punching the timeclock. You can do it, too!

#### **5. TREMENDOUS DEMAND EVERYWHERE.**

Your astounding low \$5.95 price draws a steady stream of motorist-customers. You also get big commercial accounts: new and used car dealers, fleet operators such as taxicabs, rent-a-cars, etc., plus service stations, garages and car washes. You need never run out of customers!

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MAIL THIS COUPON TODAY . . .**

**MERLITE PRESTO SHINE CORP.**

114 East 32nd St., Dept.

New York, N.Y. 10016



"Above you see one of our Merlite Presto Shine Dealerships, operated in conjunction with a parking lot. You can set up your own Merlite Presto Shine Dealership in practically any location—even at home."

### **Read What Merlite Presto Shine Dealers Say About This Great Opportunity:**

**Larry Drain of Illinois:** "Within 13 days of getting started, profits from the business paid for the initial investment—and that includes my TV and radio advertising. Since then I have been averaging between \$1,000 and \$1,500 a week! Because I cannot handle the business myself, I now have 3 employees who work full time."

**Peter J. Strikwerda of New York State:** "Yesterday I did a 60' x 12' 1-year-old trailer. I hope this is a good beginning in this area, because it was accomplished with ease and resulted in a great sense of satisfaction when I saw the trailer glistening. You can imagine the dirt, grime and film that had accumulated in one year. Now I would like to get 3 more machines."

**David J. Paradise of Massachusetts:** "Just two years ago my wife and I returned to Mass. from Arizona. We were broke. I got a job in a factory and then read about Merlite Presto Shine. Then presto, I got my dealership and started making money as they said. Today I have a steady flow of customers, and we now own our own home with an acre of land."

**Pedro Ramirez of Puerto Rico:** "As a Merlite Presto Shine Dealer, I do Simoniz wax jobs on aircraft on a contract basis. Already I have steady business contracts totaling \$500.00 a month. Recently a domestic airline signed a contract for me to do their 12-passenger Beechcrafts at \$75.00 per plane per month, and a plane takes me only 5 hours to do."

**Steven Schorr of Long Island, N.Y.:** "I am 15 years old and in junior high school. My dad will let me do only 10 cars on a weekend, although I could do a lot more, if I didn't have to do homework. Even so, I make about \$50.00 a week-end, which will go to my college education. This summer I've lined up 2 beach clubs, and 2 of my friends to do the work for me."

Merlite Presto Shine Corp., Dept. Y-15K

114 East 32nd St., New York, N.Y. 00000

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In Canada: Merlite Presto Shine  
675 King St. W., Toronto, Ont.



department. Some wives also attend to direct mail advertising to special lists of prospects and even take charge when their husbands are ill or away.

Some people turn to an agency for advice on selecting a franchise. Such an agency is Franchising Developments, with headquarters in New York and representatives in most large cities. David Seltz, who runs this operation and has written a number of books on franchising, says he has turned down 80 percent of the firms that have approached him for recommendations because they did not have enough to offer. Consulting such a specialist does not cost you anything—the franchisor pays the fee.

Two good sources of basic facts about franchises and listings of available opportunities are the International Franchise Association at 333 North Michigan Ave., Chicago, Ill. 60601, and National Franchise Reports at 115 East Ontario St., also in Chicago. Both of these organizations offer advice to prospective franchisees and publish helpful guidebooks that can be obtained for a nominal charge.

While you are deciding what type of franchise you might do best in, you can also write to the Government Printing Office in Washington for some of their Small Business Administration pamphlets, most of which sell for less than \$1 each. They are filled with advice on all kinds of franchises.

One man who hit the right business right off was Richard E. Hubel, who bought a United Rent-All franchise in Saddle River, N.J., for \$8000 in cash, some of which he was able to borrow. The franchise costs \$10,000, half of which must be paid in cash, and the franchisee must also buy \$20,000 worth of merchandise to start off, of which \$3000 must be in cash.

A United Rent-All mart supplies everything homeowners have occasional use for—garden equipment, power tools, floor Sanders and waxers, ladders, paint sprayers, and so on, as well as large quantities of party china, glass and silver, and tents for outdoor affairs.

Hubel's first year netted him around \$7,000 and his second around \$10,000. This year, his sixth in business, he expects to clear about \$18,000. The increase is due not only to hard work but also to the additional stock he has purchased. The more items you have to rent, the more customers you can satisfy—an important factor in this type of business.

Another interesting opportunity for those who are mechanically inclined is the growing chain of "Mr. Sharp" Sharpening Centers—the only operation of its kind in the country. These centers are

equipped for every conceivable type of sharpening job from scissors, knives and power mowers to saw blades, pruning shears and ice skates.

You buy the equipment as part of the franchise and are trained in its use. A completely outfitted center costs \$15,500, of which only \$6000 has to be in cash. Basic annual income is estimated at \$11,000 with the possibility of doubling or tripling this. The Mr. Sharp company, based in Lansing, Mich., helps you plan advertising and sales campaigns, contributes part of the cost, and offers a continuing consultation service to insure that you maintain a healthy business. For this, the company charges an annual fee of four percent.

Some franchise stories leave you bug-eyed. When Charles Gauchet, 23, of St. Louis got out of college a year ago, his father gave him an Oli's of Hong Kong franchise costing \$13,500. This is one of those outfits that has suits and dresses made for you in Hong Kong from fine fabrics.

For the cost of the franchise, Gauchet received a small tailor shop completely equipped with samples of fabrics and suits and dresses and instruction in measuring customers and in preparing the necessary forms. He employs an experienced tailor who is paid \$200 a week. The very first day, they took in \$2200. Today, a year later, Gauchet is taking out \$400 a week in personal salary and has had an offer of \$50,000 for the franchise. Admittedly, this was an extraordinary franchise situation—but it shows what can happen. ★★

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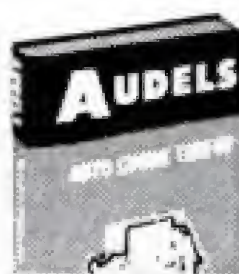
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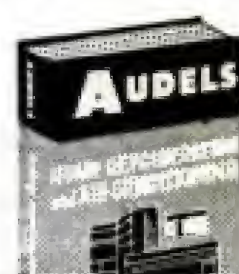
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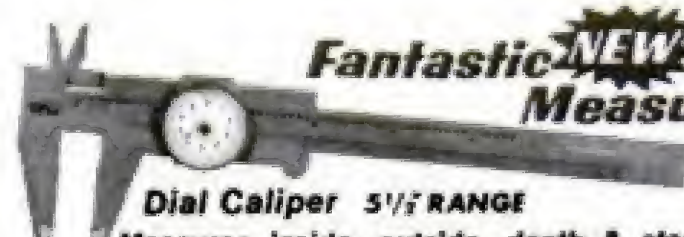
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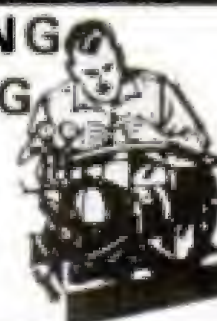
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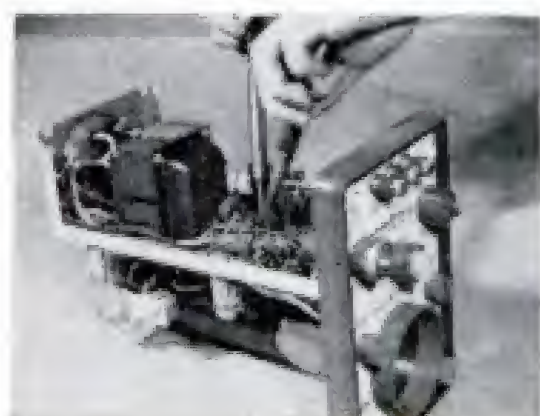
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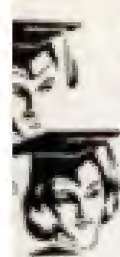
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**Q.** What is meant by "AMA horsepower?" How is it measured?—Wm. Domenici, Albuquerque, N. M.

**A.** I'm not certain of this, but I think the "AMA" stands for Automobile Manufacturers Association. As I understand it, AMA horsepower is brake horsepower measured on a dynamometer and then corrected to compensate for the theoretical frictional loss of operating, say, the alternator, or certain accessories. It can, I think, vary widely in extremes and seldom relates to the average power really available at the clutch.

**Q.** We're running a limited sportsman with a Chevy 302 engine on a one-half-mile dirt oval. We want to convert to alcohol or alcohol/nitro. How do we set a four-barrel Holley carburetor to run this fuel?—Lewis Merwine, Levittown, Pa.

**A.** I can't really answer your question since I've never tried it. However, your methanol mileage will be about 60 percent of what it is on gasoline. A mixture of 20 percent nitro with 80 percent methanol cuts mileage even further to about 40 percent of what it is on

gas. I would use an air pressure tank system to feed the carb and I think I'd increase all jets and passages to meet the fuel delivery requirements based on the mileage approximations mentioned above.

**Q.** I saw a photograph of a car being pitted during a race. The head pit man was pointing at the car with two fingers. What does this sign mean?—Janet Harper, Plains, Ga.

**A.** It could mean anything—the car's position in the race, the number of pit stops remaining, the number made, the tires to be changed, the number of shopping days 'til Christmas . . . anything.

**Q.** Could you tell me exactly what the Can-Am series of races is?—Larry Frost, Cottonwood, Minn.

**A.** The series is comprised of six professional races for Group Seven sports cars powered by engines that must be over two liters (or 122 cu. in.). The races are held in both the United States and Canada and the purses are attractive. Richest race in the series is Riverside, which pays the winner about \$20,000. In addition to purse money, last year's high point car and driver received about \$70,000 in supplementary prizes. There will be 10 races in the series this year. The cars, by the way, are the fastest road racing cars in history.

**Q.** I have Goodyear Polyglas F-70s on my '68 Torino. Cornering and handling are fine, but I get wheel hop and bounce over small irregularities and bumps in the road. Would heavy-duty shocks help?—Leon Gross, Philadelphia.

**A.** First, make sure your wheels are round and true and properly balanced. By all means  
*(Please turn to page 52)*



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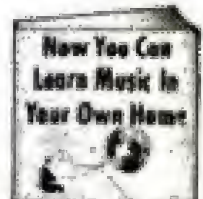
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## DRIVIN' WITH DAN

*(Continued from page 46)*

**add heavy-duty shocks. Finally, make certain tire pressures are correct.**

**Q.** *I plan to buy a new GTX for both street and strip use. Should I get manual or power steering?—Ira Stein, Bronx, N. Y.*

**A. Power.**

**Q.** *Is riding a motorcycle more dangerous than car-racing? Can a 13-year-old race karts or midgets?—Ronnie McElroy, Olive Branch, Miss.*

**A.** No, it isn't. Motorcycle riding requires good judgment more than anything else. If a driver has that, it can be quite safe and a lot of fun. To answer your other question, a 13-year-old can race a kart, but not a midget.

**Q.** *Are any race drivers color blind? Do any wear glasses?—Creed Dew, Boxford, Mass.*

**A.** I know of several top drivers who are color blind to a degree, but I'm not sure how much. A driver should be able to distinguish between red, green, yellow, blue, and so on. The easiest "colors" to recognize (also the ones drivers see the least of) are the black-and-white of the checkered flag. Yes, many top drivers wear glasses.

**Q.** *What is Stirling Moss doing these days?—Mark Parus, Mt. Calvary, Wis.*

**A.** Among many other things, Stirling is an important part of the Johnson Wax public relations and promotion staffs, particularly in relation to the Can-Am series. Also, he's a racing broadcaster, has several product endorsement contracts, and serves as consultant to racing circuits throughout the world.

**Q.** *In what recent years did Ford engines win at Indianapolis? I say from 1965 to 1968, but my buddy says only 1967 and 1968.—Tom Glusyk, Westland, Mich.*

**A.** Ford power was used by winners Jim Clark in 1965, Graham Hill in 1966, and A. J. Foyt in 1967. Bob Unser's winning car last year was powered by an Offy engine.

**Q.** *What make is the 396-cu.-in. engine David Pearson used in his 1968 Torino on the smaller tracks?—Bob Carver, Spring Lake Heights, N. J.*

**A.** It's a Ford all the way, Bob. The 396 engine is a de-stroked 427.

**Q.** *If Cadillac has the biggest V8 engine in a production passenger car, why isn't it used in stock-car racing? Why aren't there any front-wheel-drive cars in stock-car races? If headers give a car 40 hp more, why aren't they standard equipment?—Dave Jonas, Bay Village, Ohio.*

**A.** Stock-car racing rules limit maximum displacement to 428 cu. in., plus or minus an inch. Front-wheel drive is not as good as rear-wheel drive when it comes to full acceleration, because under full power, weight tends to shift to the rear wheels. Headers do not last as long, nor are they as trouble-free as conventional equipment. They cost more to make and are slightly more noisy.

**Q.** *How did you get started in racing?—Philip Berry, Olathe, Kans.*

**A.** I began with the California Sports Car Club, a group that no longer exists. I raced a Triumph TR-2 and a Porsche 1600-S in amateur road races. I gradually managed to drive cars owned by other people in amateur road races, and finally graduated to professional road-racing after building a favorable reputation as a driver.

**Q.** *Innes Ireland drove a turbine and said he had never experienced such powerful acceleration. Joe Leonard said after Indy that the turbine did not have enough acceleration on straightaways. Who's right?—Jack Fowler, Toledo, Ohio.*

**A.** I'm not sure they drove the same turbine, but both are excellent drivers and I think you can say both are right. Again, it boils down to hp and torque and mass.

**Q.** *I recently saw a TV special about you in which you were pictured on a bike. What kind was it, and how many cc?—Dave Dougherty, Ludington, Mich.*

**A.** A Montesa 250-cc scrambler. I ride a Montesa 360-cc scrambler now when I get the chance. ★ ★ ★

---

*If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 84).*

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# HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

## 'Rusty' basement walls

*My cinder-block basement walls are coated with light yellow and pale blue masonry paint. What look like rust spots are appearing on sections below ground level. There are no leaks. What is this and what is the remedy?—A.T., W.Va.*

I'd guess the "rust" spots are actually rust or, perhaps more properly, the result of oxidation of metallic substances in the blocks. Many cinder-block makers use slags and other aggregates containing metal particles. Slow oxidation of the metal in the presence of moisture causes rust, or inner-wall surface discoloration.

There's no simple remedy. Some masonry paints seal better than others against such discolorations, but even these are not entirely dependable. Perhaps the surest remedy is to cover the walls with a cement plaster troweled on  $\frac{3}{4}$  in. thick or more. The oxides are unlikely to bleed through such a coat. If you are sure the present coating is a masonry paint (not an oil-base or other types), the cement plaster will bond to the wall without the aid of any other preparation.

## Stain or paint?

*I've just purchased a summer home with walls of stained shingles. I was told that originally the walls were stained with creosote. Now tips of the wood shingles are turning gray and, in two areas back of shrubbery, there's marked discoloration. Here and there the shingles are roughened—weathered, I suppose. Can these walls be painted?—S.S., Mich.*

Some paints can be applied over creosoted shingles, but I recommend you stick with the original stain. It provides good protection, measurable proof against insect invasion and it's long lasting. If the weather-roughened shingles are not curled or cupped appreciably, a light sanding should prepare them adequately for restaining. Cupped, cracked or badly curled shingles should be replaced.

When applying new stain, work it well into the wood and into openings between the shingles. Remove any shrubbery brushing the walls and trim low-growing trees nearby to gain better air circulation.

## Pinpointing roof leak

*Shingles on my home are laid over a low-pitch plywood deck. I've just discovered a leak and don't know how to locate it. About halfway down the ridge, it shows as a discoloration at a joint in the deck. How can I pinpoint it?—D.W., Nev.*

It's going to take some rather blind sleuthing. You're reasonably certain that water is coming through at a point more or less directly above the discoloration at the joint in the plywood deck. You also know this point can't be more than 4 ft. above the stain. So, drive back the projecting ends of the roofing nails across the width of the plywood sheet directly above where the stain appears. Then go up on the roof and gently lift the loosened shingles until you locate the cause of the leak.

This may turn out to be a split or broken shingle tab, a bent nail hammered inadvertently through a shingle, a not-fully-seated nail, permitting rain to creep under a shingle, or other damage. Once you've found the cause, the remedy should be quite simple: replace a defective shingle or seal a break with roofing cement. Drive all nails back in place.

## Unsticking old glue

*I have an old, rather battered and wobbly rocking chair that I'd like to take apart, rework and refinish fit for use again. But how do I unstick the glued joints, some of which appear solid and others a bit loose?—P.H., Tenn.*

Perhaps you should visit a local antique shop or furniture repair man and watch an expert reduce an old chair to individual pieces in minutes, using a wooden mallet or a soft hammer. He'll likely do it without breaking or even damaging a single part. That's your clue to procedure. As a rule a light tap with a soft hammer will break old glued joints without damage. You can then scrape the glue from the tenon and ream it out of round holes with a twist drill of the same size as the hole. On some old glues ordinary vinegar acts as a softener if you can get it where the glue is, but be careful—this may darken some woods.

You may not need to disassemble the old chair. Consider using a glue injector to tighten the loose joints and do the rest of the cleanup with a scraper and sandpaper. The injector, simple and inexpensive, has a container you fill with glue and a plunger you operate by hand or the light tap of a mallet. Drill a small hole into the joint, insert the injector nozzle, then just press or tap the plunger. ★ ★ ★



Need More Money? Want to Be Your Own Boss?

# START SAW SHARPENING BUSINESS

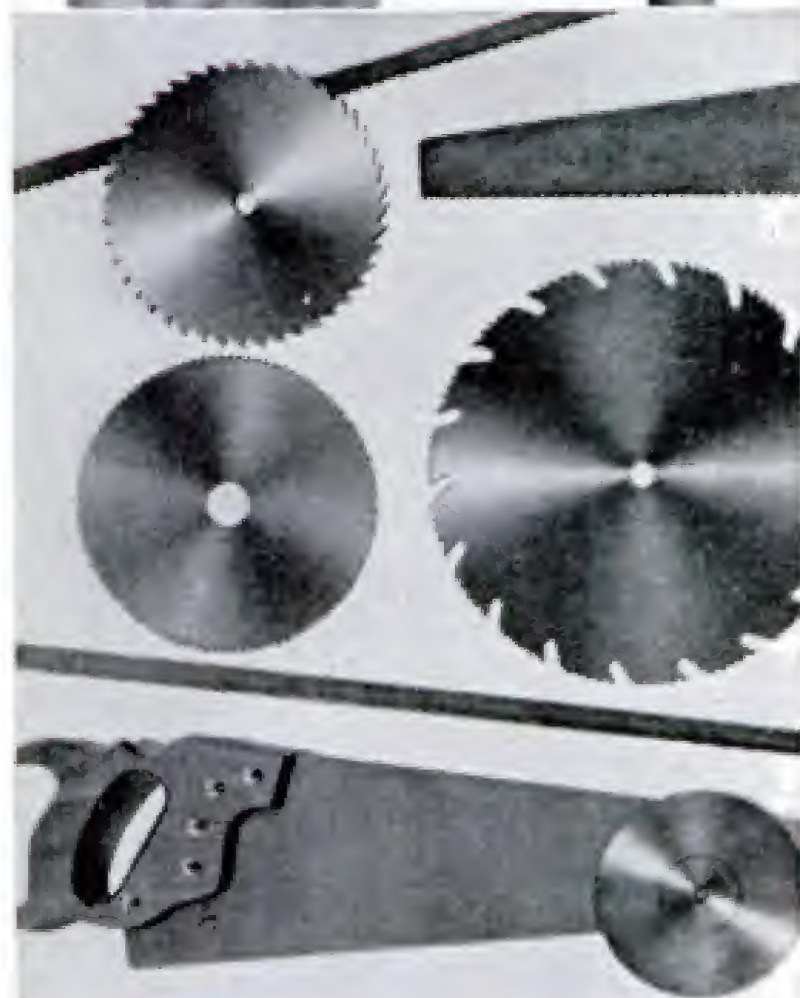
Of Your Own — in Your Sparetime



Turn your spare hours in the evening or week-ends into extra dollars, this proven practical way—start your own money-making sharpening business—No selling or canvassing—No experience required. You can do it automatically with the Foley Saw Filer or Lawn Mower Sharpener.

## Beginners Earn \$3 to \$6 an Hour

People, just like yourself, all over the United States are making extra cash—\$20 to \$30 a week—right now in their spare time. "My sparetime saw filing business has made me \$952 these first ten months," says R. T. Chapman. Many start part-time, find it so profitable that they build year-round service business. You can, too, simply by following easy Foley plan.



## Town of 150 Supports Profitable Business

Here's the story from Dick and Jo Ann Koester after being in business less than a year. "We have acquired another Foley Saw Filer and for the past two months we have been in full-time operation. As we live in a small town of 150 population in farm area we use our truck to pick up saws in five nearby towns. With a family to support and plans for building to our house we had to pick up a business fast and already sharpen an average of 15-20 saws a day. Business for the future looks even better as good machine filing is our best advertising."

## CASH for Sharpening Mowers

Every neighbor with a lawn needs his lawn mower sharpened at least once a year. No experience is needed to start—anyone can operate and turn out professional jobs. All operations are handled quickly, easily and accurately.



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with amazing

## Foley Saw Filer

You can sharpen combination (rip and crosscut) circular saws, band saws, hand saws, crosscut circular saws—and do a perfect job every time without experience or special training. The precision Foley Filer does it for you automatically! A complete repair shop in one machine! Set up in basement or garage, work your own hours in your own way and earn big sparetime profits.



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Free Book "Money Making Facts" shows just how you can start at home in spare time. Small investment—time payments if desired. Get this booklet—study it! Send coupon today. No salesman will call on you.

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### British conduct mock tank battles with lasers

Armies can now conduct realistic tank battles safely with a British gunnery simulator that fires electronic "shells" from a laser projector fitted on the gun barrel (upper right). When detectors on the target tank (upper left) are hit by the low-powered infrared laser rays, the tank "burns" (lower right). At lower left is a completely equipped Chieftain tank.



### Newspaper by telephone

Whole newspaper pages are sent as electrically encoded pulses over telephone lines with Bell's new data conversion terminal (right). It transmits a page in six minutes.

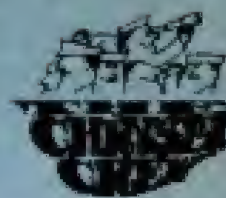


### Clean teeth for killer whale

Brushing the teeth of the killer whale in the Coney Island Aquarium takes a deft hand for she could snap a man's wrist with her jaws. The brushing removes algae from her teeth.



# Look what happens when you power a Chrysler with a Chrysler!



Nobody else engineers a boat-outboard combo like this one... because only Chrysler makes both the outboards and the boats they power.

So, get your family a boat and a motor that were planned to go together. A matched set—in weight, balance, power and load capacity; a matched rig that handles easily, corners smoothly, performs

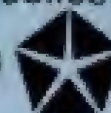
the way a boat *should* perform. Fishing, skiing, cruising—you'll get your kind of safe family fun.

There are lots of Chrysler combos. There are 44 Chrysler boats—from 12 to 24 feet—all B.I.A. certified for safety. There are 39 Chrysler outboards—3.5 to 105 hp.—including lightweight Lo-Profiles, economical Mid-Rangers, and mighty Magnapowers, with the

industry's most dependable ignition system. Or, if you want Chrysler inboard, inboard-outdrive or V-Drive power—there are 27 choices from 80 to 335 hp.!

A smart choice? . . . absolutely. For the name of your dealer, call 800 243-1890. It's free! (In Connecticut, call collect: 325-4336.)

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CORPORATION



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# SOLUTIONS FOR MECHANICAL HEADACHES

# AUTOMOBILE CLINIC

BY MORT SCHULTZ

## Pooped spring

*I recently bought a 1965 Dodge Monaco with one of those crazy-tilt steering columns. All's well except for one minor problem. When the wheel is in the down position, the turn-signal switch won't cancel of its own accord. Is there anything I can do about it?—Ken Boyle, Portland, Ore.*

A Dodge service bulletin points out that this car has a detent spring in the switch that's too light to handle the load. You can get rid of your problem by installing a new detent spring. Get part No. 2467807 from a Dodge dealer.

## Stained rear glass

*What's the best way to clean stains and discoloration from the back glass of my convertible so I can get better vision?—Len Turner, Baltimore.*

Oldsmobile offers a good solution. Use a clean polishing pad on a medium-speed polisher with Dry Cleaner. You can get this Oldsmobile product from a dealer (ask for part No. 982066). The deeper the abrasion or the darker the stain, the more pressure you'll have to apply to the polishing wheel. Really deep scratches and some stains can't be removed entirely, but all can be cleaned to some degree.

## Floating on air

*My 1966 Chevelle station wagon has a vary scary medium to high-speed floating effect when the brakes are applied. I've been told this is a built-in condition. Adjustments and linings are okay. Is there a cure?—William Hyde, Warren, Mich.*

Delayed braking action can be scary, but as you say, your braking system is okay. Putting in a power-brake unit (a relatively inexpensive option) will take the delay out.

## Wiggly wheel?

*My 1966 Pontiac vibrates at 60/75 mph. Tires have been trued and balanced, new heavy-duty shocks installed, new ball joints installed, front end adjusted, drive line checked, and so on. Vibration seems to come from the left rear section of the*

*vehicle, and I've noticed that the tire on the left rear wheel has ripples on the outer tread. What now?—Donald D. Prawl, Hixson, Tenn.*

Go to work on the problem at the point of origin. Obviously, the source is in that left rear wheel area, probably with a bad wheel bearing or perhaps a bent axle shaft.

## Axle arbitration

*My 1968 Plymouth Sport Satellite seems to have too much slack in the rear. When I push on the gas and let up or when I stop quickly, I can hear and feel slack taking up. My dealer says this is normal, and there's nothing to do for it. I don't buy that. Please help.—Kenneth Moore, Memphis, Tenn.*

All cars have a certain amount of rear-end backlash. This is normal clearance between the rear end and transmission. However, if backlash is excessive, there could be too much clearance between the pinion and ring gear in the rear, or too much slack in the rear end spider gears. I suggest you ask the dealer to call in a factory-trained field representative to let him make the determination.

## Thar she blows

*The engine of my 1963 Ford Fairlane throws oil through the oil filler, which points to trouble with the PCV. Right? Wrong! The valve's been replaced, the mesh filter in the block under the PCV flange fitting cleaned, and a new oil filler cap installed. I still get oil all over the place. Have you a solution?—William E. Pilgermayer, Glenside, Pa.*

Yes, Sir. Take off the intake manifold. There you'll find a piece of screen mesh. Remove it and throw it away. Then, remove the oil separator and screen, and throw that away, too. This hardware was put on the car during this model year, which was the first year they started experimenting with devices to cut down on air pollution. The screening which is probably plugged, is not necessary and may well be building up a great deal of internal pressure that's forcing out oil. Unfortunately, this pressure may have already  
(Please turn to page 86B)





## For You Who Know Good Tools . . . And Won't Buy Any Other Kind

If you're one of those discriminating hand tool users who know and demand only the best, chances are you're already a Channellock customer. You know the beauty of full-polished, drop-forged steel, the smooth working precision-made working parts, the fine, hand honed cutting edges that distinguish hand

tools by Channellock. What you may not know is the wide choice of Channellock quality tools available to you. You can treat yourself to an arm-chair visit with the entire Channellock family in our color catalog. Let us send you a copy, no charge.

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**CHANNEL LOCK**  
MEADVILLE, PA.





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Here is everything you never thought a pickup was.

With 83 advancements that make it the first complete pickup.

Here's a smooth new ride you might expect from a car. Here's handling ease you'd

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Here's the pickup with all new style, new color, inside and out. With greater new vis-

ibility, roomier cab, comforts you never expected.

Here's sure, smooth power from INTERNATIONAL's four great engines. Including three big V-8's and the new Power Thrift Six with 10% greater gas mileage.

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Here's the pickup with the widest choice of new features and options, from wheelbases to air conditioning to trailer hitches. For serving the widest needs. Business, personal transportation, recreation.



We've reinvented the pickup. It's still the strongest, most durable of all. But now it's everything else too.

 **INTERNATIONAL HARVESTER COMPANY**  
CHICAGO, ILLINOIS 60611



## AUTOMOBILE CLINIC

(Continued from page 84)

ruined the valve seals, and new ones may be needed before you can cap that gusher from the oil filler tube.

### Driving a diesel

*My wife's 1967 Camaro dieselized the first week we took it from the showroom, and it hasn't stopped. Tune-ups don't help, long trips at 65 mph don't help, premium gas doesn't help and a new transistorized ignition system hasn't helped. What do I do now?—Bill Schulz, Wenonah, N.J.*

Get back to basics. The No. 1 cause for a car's dieseling—running after the ignition is shut off—is red hot carbon particles in the engine. Excessive engine idle speed may be another reason. Ask your dealer to check these possibilities. And if your car is still under warranty, use it.

### Concealed condensation

*It happened the first rain after I bought my 1968 Chrysler Newport, with vinyl roof. The front windshield, I thought, started to leak. It was replaced twice by the dealer, yet the inside top of the car is always sticky, and when it rains it gets damp all over. My dealer assures me there's no leak. What can cause this?—Andrew Callahan, Coeur d'Alene, Idaho.*

Water leaking or condensation can cause dampness. Try driving with the windows open to see if the problem continues. If not, condensation is the trouble and the cure is more ventilation inside the car. Otherwise, there's a leak somewhere that the dealer may need help in finding. Ask him to call in a factory field rep.

### Spotty service

*My 1968 Plymouth Sport Fury (383-cu-in. engine with four-barrel carburetor) has run rough since the day I took delivery. Every now and then it fires back through the carburetor. My dealer says there's no cure for this problem. Is he right?—Bob Rittelman, Forestville, Md.*

No. This carburetor is obviously running on the lean side. It takes a lot of work to set it up right if correct idle cannot be

achieved normally. The plugs over the idle-mixture screws of 1968 (and 1969) cars must come off, and idle set with an exhaust gas analyzer. These plugs, which prevent the owner from adjusting the mixture too rich, are antipollution devices required by federal law. As outlined in the service manual, the work involved in removing the plugs and setting up the carburetor is considerable. But that's no reason to offer such a lame excuse and slough off the problem as your dealer seems to be doing, even though, in your case, the warranty assures that the work will be done at no cost to you.

## SERVICE TIPS

● **Chrysler owners** who have airconditioning systems in cars made prior to the 1968 models have had a problem with windshields fogging when the defrosters are operating. The factory says that the trouble can be minimized by operating the airconditioner for at least two minutes before turning on the heater or defroster. This removes the excess moisture from the air, which is the chief cause of fogging.

● **1968 Corvair owners** who have been doing their own ignition timing, using specifications on page 44 of the owner's manual, have been getting the wrong time. The specs have been changed by Chevy as follows: 95-hp engine—6° BTDC with manual transmission, 14° BTDC with automatic; 110-hp engine 4° BTDC with manual transmission, 12° BTDC with automatic; 140-hp engine—4° BTDC with manual or automatic transmission.

● **1969 Ford or Mercury owners** who have airconditioning may find the edge of the fan belt frayed or fuzzed soon after taking delivery. Don't worry about it. It's normal, won't affect the wearability or life of the belt, and should wear off within the first 150 to 250 miles of operation. The condition is the result of the edge construction of the so-called Nomex cord fiber belt that's used on some models.

● **Chevy tells us** that too many air-injector reactor pumps have been damaged by prying against the pump housing to adjust the belt drive. This housing is made of cast aluminum and easily deformed. If necessary to adjust the belt with a pry bar, apply pressure against the pump's cast-iron end cover. ★ ★ ★

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**GOT A PROBLEM WITH YOUR CAR?** Ask Mort about it. Send your question to Auto Clinic Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Letters cannot be answered individually, but problems of general interest will be published in the column.

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## A fast new way to blast carbon out of your car's engine.

Sure, you know what happens when carbon deposits build up in an engine. You know how power drops. How pickup slackens off. How you start burning more gas and oil. How knocks and pings creep in.

You know all this. But sometimes it takes the jolting cost of an overhaul to make you really aware of the damage carbon deposits can do.

Carbon plus lead equals trouble. You get carbon deposits with everything you burn—logs in your fireplace or gasoline in your engine. But why can't the deposits in your engine be brushed away as easily as the soot that collects in a fireplace? Because gasoline contains lead compounds and other non-combustible elements. These additives, under enormous heat of combustion, combine with carbon particles to form tough, flinty deposits that build up, layer by layer, on pistons, valves and cylinder heads.

You sometimes see products that promise to dissolve the carbon in your engine. Don't be taken in. This kind of carbon is almost indestructible. Nothing on earth can dissolve it. You can't *dissolve* carbon deposits any more than you can dissolve diamonds.

But, with remarkable new Fuel Mix Tune-up Concentrate, you can rid your engine of carbon deposits, quickly and easily. As easily as pouring a can of it into your fuel tank. Fuel Mix doesn't do a thing to carbon. But it's murder on the lead compounds that "cement" the carbon particles together. It reacts chemically with these compounds, breaks them down so effectively that carbon deposits magically flake off—and are blasted out through your exhaust system.



In the combustion chamber, hard, crusty carbon deposits build up on pistons, cylinder heads and valves to cause knock, ping, fuel waste.

Good for engine break-in, too. Fuel Mix also protects your engine by lubricating the hot, oil-starved upper cylinder area to improve valve and ring action. Add a can to each tank of gas during the first 1,000 miles you drive a new car or rebuilt engine. It'll help prevent excess wear during those first critical miles of driving.

Use Fuel Mix regularly every 1,000 miles. You'll notice a big difference in engine performance almost immediately. Smoother, quieter running. Eager response. And power you forgot you had. But please don't take our word for it. Look for Fuel Mix wherever fine automotive products are sold, and give it a try. Prove to yourself that it really works.



Before Fuel Mix is added to the fuel tank, cylinder heads are encrusted with layer upon layer of deposits of carbon and lead compounds.

After 4½ hours of driving, Fuel Mix has already removed most of the deposits, to improve engine performance and fuel economy.

**GUMOUT** Pennsylvania Refining Company  
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A fast new way to  
**BLAST CARBON**  
out of your car's engine.  
And it really works.





# We'd like to put in a good word for hoods.



Why not? We've got the toughest looking in the business.

Take that sweep of metal on the '69 Pontiac Grand Prix. You won't find a longer stretch from Sing Sing to Alcatraz.

The two bulges on Firebird 400 and GTO are pretty unsubtle, too. They're air scoops. Functional air scoops when you order Ram Air.

Now, you can order an externally mounted tach for each of these hoods. And they'll look tougher. But let's face it. No hood's complete without a persuader.

Pontiac has them.

Grand Prix's is a standard 350-horse, 400-cubic-inch V-8. Or specify a 370- or 390-horse 428-cube V-8.

Firebird 400 has a 330-horse, 400-cubic-inch V-8 standard. You get even more impressive statistics when you order the H.O. or Ram Air IV version.

GTO started it all. Remember? A 350-horse, 400-cubic-inch V-8 is standard. A 366-hp V-8 and a 370-hp Ram Air IV await your order.

Obviously, this is no year to go around bad-mouthing Pontiac's hoods.



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4 individual color pictures of our '69 Break Away Squad, specs, book jackets and decals are yours for 30¢ (50¢ outside U.S.A.). Write to: '69 Wide-Tracks, P.O. Box 88H, 196 Wide-Track Blvd., Pontiac, Mich. 48056.



**DAYTONA PREVIEW:**

The Chargers and Road Runners know the guys to beat—the 'pilots' of Torinos and Cyclones

By BILL KILPATRICK,  
Auto Editor

**H**E DOESN'T LOOK like a winner. Not in this photograph, anyway. But Cale Yarborough—an amiable, engaging leadfoot from a South Carolina whistlestop—is stock car racing's official all-time moneybags.

In fact, the photo shows an exhausted Yarborough minutes after he drove his '68 Wood Brothers Mercury to second place in last season's Old Dominion 500 at the Martinsville (Va.) Speedway—the race that earned him \$2700 and boosted him \$431 over Richard Petty's 1967 record earnings of \$130,275.

Following Martinsville, Yarborough ran his 1968 prize money up to \$136,786, a juicy target at which the rest of "them good ol' boys"—plus a now-and-then sprinkling of such USAC stars as A. J. Foyt, Mario Andretti, Dan Gurney and others—are aiming as NASCAR's 1969 Grand National season hits full stride.

Richest and most prestigious stock car racing bauble for drivers, car owners and

# Can Chrysler Put The Crunch On Cale?

Photo by Stanley Rosenthal





**DODGE CHARGERS** will be Chrysler's trumps in effort to dominate big-league stock-car racing this year. Here Charlie Glotzbach leads Buddy Baker out of a turn during last year's National 500, won by Glotzbach

auto manufacturers is this month's Daytona 500. Because it's the fastest, most grueling event on the NASCAR calendar, the winner gains—in addition to upward of \$50,000 in prize money—a psychological “leg up” on the competition; the fact he even *exists* is a formidable force with which others must contend for the rest of the season.

Yarborough's win last year kicked off an unprecedented superspeedway win streak. Following Daytona, he won the Atlanta 500, Firecracker 400 (which he had won in '67—this made it three in a row at Daytona), and Southern 500 at Darlington. Ford Motor Co. was so delighted it named Yarborough its Man of the Year.

Ford had other reasons to cheer, too. When the 1968 NASCAR season ended, Ford had the manufacturers' championship again, and David Pearson in a Holman-Moody Ford Torino

won the Grand National drivers' point championship.

Watching the Fords go by in most of the big, headline-grabbing events was, of course, Chrysler. It's true that Richard Petty, in 1967 the nearest thing to Superman this side of comic books, drove a Plymouth to 16 Grand National victories in '68. It's true that Bobby Isaac, in a Dodge Charger, went right to the wire with Pearson for the point championship. And it's true that the season's superspeedway finale—the National 500 at Charlotte—was won by Charlie Glotzbach in a Dodge Charger, leaving Chrysler with a pleasant aftertaste. But that isn't what Chrysler has in mind; despite operating on a smaller racing budget than Ford, it wants to drive the Dearborn Demon right into the ground as it did in 1964. That will be tougher than ever in '69, for Ford will have even the Pettys on its side





**CALE YARBOROUGH** leads Lee Roy Yarbrough through a turn at 1968 Daytona 500, one of the closest, most exciting races ever run. Neck-and-neck most of the way, Yarbrough managed to win by a one-second margin

this year. Their switch, after ten years with Plymouth, really shook up pit row.

The most formidable weapon left in the Chrysler arsenal is the new Dodge Charger 500, a car frankly designed for racing. Featuring a flush-mounted grille and a more slanted, also flush-mounted rear window, it reportedly affords better aerodynamic characteristics than the '68s. Spearheading Chrysler's effort will be Buddy Baker, driving for Ray Fox, Glotzbach for Cotton Owens, Isaac for K&K Insurance, and 1968 Grand National Rookie-of-the-Year Pete Hamilton for A. J. King, all of whom will be at Daytona this month.

About the fastest Plymouths in sight at this writing (late November) will be driven by Bobby Allison and Darel Dieringer. Allison will drive for Tom Friedkin, Dieringer for Mario Rossi.

Arrayed against this small, valiant

band is a horde of Fords and Mercurys driven by some of the biggest names in racing. Carrying the Dearborn banner at Daytona and throughout the year will be Yarborough, driving for the Wood Brothers, Pearson for Holman-Moody, Lee Roy Yarbrough for Junior Johnson, Donnie Allison for Banjo Matthews, Tiny Lund for Bud Moore, and all-time NASCAR winner Richard Petty for Petty Engineering. Master mechanic and car builder Henry "Smokey" Yunick, now in the Ford fold, possibly may field a car, the driver of which could be Paul Goldsmith, who won the last "beach race" for Smokey in 1958.

Supplementing this all-star lineup at Daytona and certain other FIA-approved superspeedway events will be the likes—some likes!—of Foyt, Gurney and Andretti, all in one way or another tied to Ford. Foyt will drive for Jack





**THINK DETROIT'S RANK AND FILE DOESN'T CARE** what happens on the major stock-car circuits? This header, dispatched from the Dodge factory, plainly bears the competitive sentiments of the men who made it

Bowsher, Andretti for Holman-Moody. If and when Gurney appears in a stock-car race outside of his annual Riverside 500 outing, chances are it will be in a Wood Brothers car.

In addition to having what seems like all the cars and drivers, Ford this year will campaign its big, new 429-cu.-in. engine. You can be sure nobody's doing much talking, but the word is that the engine in racing trim cranks out well over 600 hp, power that can be put to fruitful use on Daytona's long, booming straights. Chrysler hopes to equal Ford's power advantage via carburetion modifications on its famed and formidable 426-cu.-in. Hemi. Last year, NASCAR let the Hemi run with two four-barrel carburetors, a combination few Dodge or Plymouth crews got running to their complete satisfaction. But this year the Hemi is single again, a setup the crews know how to handle. Also in effect this year is a uniform overall car weight requirement of 3900 lbs.

All this added horsepower, plus spoilers and more sleek aerodynamic

body design, will probably push this month's qualifying speeds at Daytona up to around 195 mph. Yarborough gained the pole last year by qualifying at 189.22.

Race speeds will go up, too. Last year, the leaders hit speeds of 182-183 at various points. This year, they could go as high as 187-188.

If these eye-popping qualifying and race speeds aren't reached at Daytona this year, it won't be because Firestone and Goodyear don't have tires that'll take the punishment. They do. The drawback, if any, will be that drivers are groping toward the unknown; at the higher speeds on a track like Daytona, they're not sure at exactly what point the car ceases to be a car and becomes a projectile. Despite jack screws, spoilers, weight distribution gimmickry, and an admittedly liberal interpretation of what is "stock" in a stock-car front end, that front end starts to get pretty light as speeds approach 180.

As a result, drivers going that fast

*(Please turn to page 220)*





## Blind ballplayers keep their ears on the bell

The blind soccer players above can't see the ball—they hear it. A small bell attached to the ball (left) allows the players to follow its general direction. Behind each goal is a battery-powered bell (right) to indicate the location of each net. The system was devised by an organization for the blind in Milan, Italy, which hopes to establish international matches.



## It's only a model—the real thing's even bigger

Carrying a crew of two, this 37-foot "baby" VT-1 hovercraft is a working model of a bigger design to come. Built to a 40-percent scale by British firm, Vosper Thornycroft, it uses two 70-hp VW engines for lift, two 130-hp Porsche engines for forward propulsion.



# **HOW DEEP WILL DIVERS WORK?**

**The other question is:  
Can they stay long enough  
to get something done? New systems  
permit aquanauts to 'commute' to their  
jobs without decompressing between trips**

**By WALLACE CLOUD**



**I**S THERE A "DEPTH BARRIER" beyond which divers cannot work exposed to the pressure of the sea?

Diving physiologists—medically trained scientists who specialize in studying the body's responses to undersea stress—are now beginning to discover that there is, indeed, a mysterious barrier to human survival at a depth somewhere below 1000 feet.

Until recently, only one man had lived through a dive to 1000 feet. The Swiss diver, Hannes Keller, made it off Catalina Island in December, 1962. A companion died on that dive.

Keller's record was surpassed by Dr. Ralph W. Brauer, a North Carolina scientist, and French engineer Andre Veyrune, who "descended" to the equivalent of 1190 feet in a pressure chamber on land, in Marseilles last June. Both men experienced tremors, starting around the 900-foot level, and were drifting in and out of sleep. "I had trouble distinguishing right from left," said Dr. Brauer. "I had trouble reading my watch. I recognized the danger, but it didn't really seem to matter."

In the test, both Brauer and Veyrune

**DEEP DIVING** has barrier, too. Men in backpacks, at this state of art, can go to about 1000 feet. One backpack, developed by Alan Krasberg (below, left), is shown in front and rear views (right). A diver uses two lunglike bags, exhaling into one, inhaling from other, reusing original gases. Krasberg relaxes in deck chamber, pressurized to depth of intended dive, eliminating decompression





were breathing the mixture of helium and oxygen that is now standard for deep dives. Brauer believes hydrogen is the key to reaching depths below 1000 feet. No more than two-percent oxygen is needed at such depths, he says, and helium would replace the hydrogen at depths shallower than 600 feet.

The question of the depth barrier has become important because working divers now have equipment enabling them to spend long periods at depths approaching 1000 feet. This was demonstrated, even before the Navy's Sealab III project, by teams of industrial divers from two competing undersea-engineering firms who made little-publicized dives in the 600-to-700-foot range, living at deep-sea pressures for many days at a stretch.

Those successes led to confidence, in the undersea business, that divers can now work freely at least to 1000 feet, perhaps deeper. That meant all the world's offshore continental shelves, with a total area as big as Africa and a 1000-foot maximum depth, were suddenly open to exploration and commercial exploitation.

Westinghouse was the first to carry out a 600-foot working dive in the Gulf of Mexico, in the summer of 1967. Next came a similar dive to a slightly greater depth, 636 feet, by divers of Ocean Systems, Inc., a firm owned jointly by Union Carbide Corp. and General Precision, Inc. Last March, Ocean Systems divers made a dive to 700 feet in the Bahamas, using a little submarine to "lock out" and "lock in" at the working depth.

Unlike the Sealab divers, the men using the Westinghouse and Ocean System techniques do not live on the bottom of the sea. Between working periods, they remain under deep-sea pressure in a compression chamber aboard ship. A second chamber—a sophisticated diving bell—is used like an elevator to transport divers to and from the working depth.

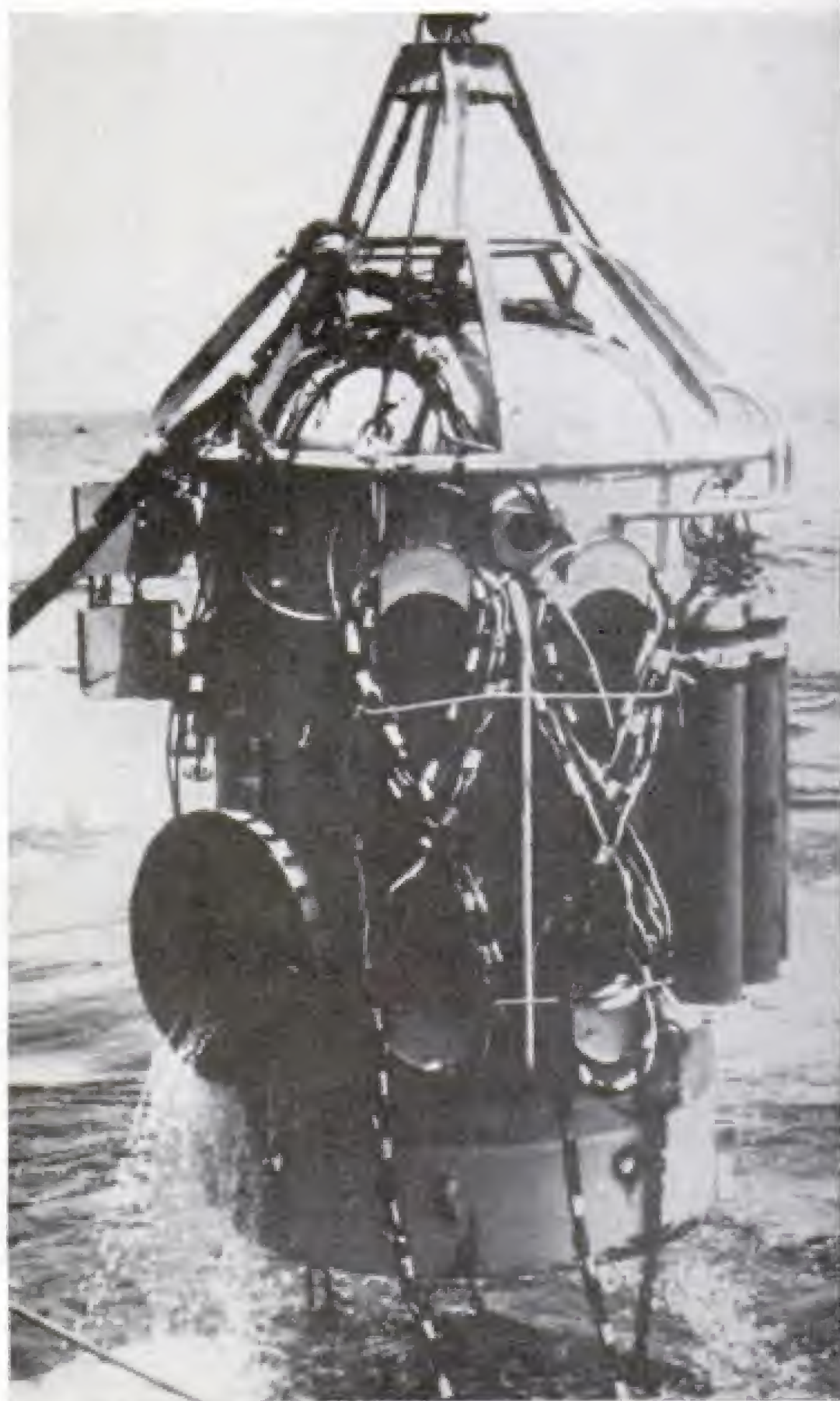
"We think that's why we don't see

the fatigue problems they encountered in Sealab," said Alan Krasberg. "Sealab divers were constantly exposed to the undersea environment, and had to do all their own housekeeping. We provide the men with comfortable ship-board quarters and support facilities, and they can put in a six-hour working day, the same as divers working at shallower depths."

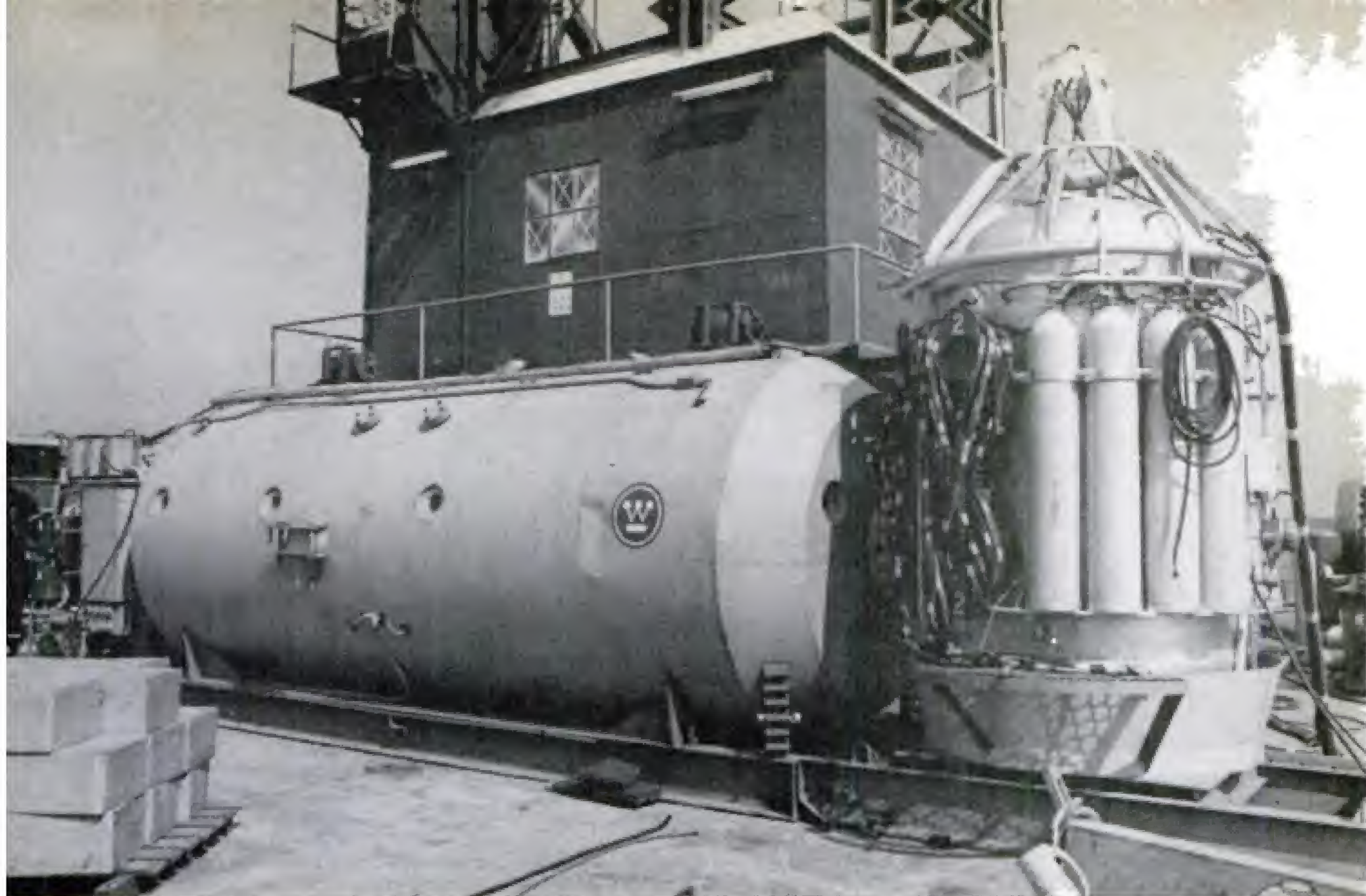
Perhaps they have other incentives—such as their \$3000 to \$4000 a week pay.

Both companies use essentially the same approach. The combination of deck-compression chamber and smaller elevator chamber was developed originally by Edwin A. Link, inventor

**DIVERS DESCEND** inside small chamber, already pressurized to programmed depth. At that depth, they will emerge for preplanned activity outside chamber







**BETWEEN DIVES** divers ascend inside small chamber which is attached to large deck chamber. Without decompressing, they can relax inside large chamber in comfort, extending total time they can spend working

of the Link aviation trainer and mastermind of Ocean Systems. Westinghouse developed equipment along similar lines, calling it the Cachalot system (named after the French word for whale, what the deck chamber looks like to some people).

Such advanced diving systems are designed for the technique of "saturation diving." That means the divers continuously live in an atmosphere pressurized to the equivalent of a specific depth in the sea, so that their blood and tissues become saturated with dissolved gases at that pressure. They decompress only after completing days or weeks on the job.

How an advanced diving system works can be seen in the Westinghouse dive to a 600-foot depth in the Gulf of Mexico.

The operation began when six divers entered the compression chamber on the deck of a barge anchored 45 miles off Grand Isle, La. In the chamber they breathed a mixture of oxygen and helium instead of air. This atmosphere was

pressurized to a "storage depth" of 350 feet.

Through an airlock, diving teams of two or three men at a time entered the elevator chamber, also pressurized to the equivalent of 350 feet. This chamber has a side hatch that mates with the deck chamber, and a bottom hatch for use in the water. With both hatches sealed, the diving chamber was lowered over the side trailing an umbilical of cables and hoses.

At 350 feet the pressure of the water outside equaled the pressure inside the chamber, and the bottom hatch popped open. The men donned their rubber suits. Warm water, fed through a hose from the surface barge, flowed into the suits near the waist and out at the ankles and wrists. The chamber continued to descend. Water was kept from rising through the hatch by increasing the pressure of the atmosphere inside.

At the working depth, divers left the chamber to perform assigned one-hour

*(Please turn to page 210)*





# How to Buck

These tips from experts who make their living fighting snowstorms on Colorado's highest highways may save your life in the lonely terror of a whiteout

By E. D. FALES JR.

*Illustrations by Dale Gustafson*

**D**RIVING IN SNOWSTORMS has never been a picnic. But it is becoming more dangerous as traffic gets thicker and speeds go up. In one eastern storm last winter, 300 cars were smashed in 50 pile-ups. Some involved 10 cars. At Syracuse, N.Y., 29 cars collided in one pile. Near Ottumwa, Iowa, eight motorists were killed in a single snowdrift crash.

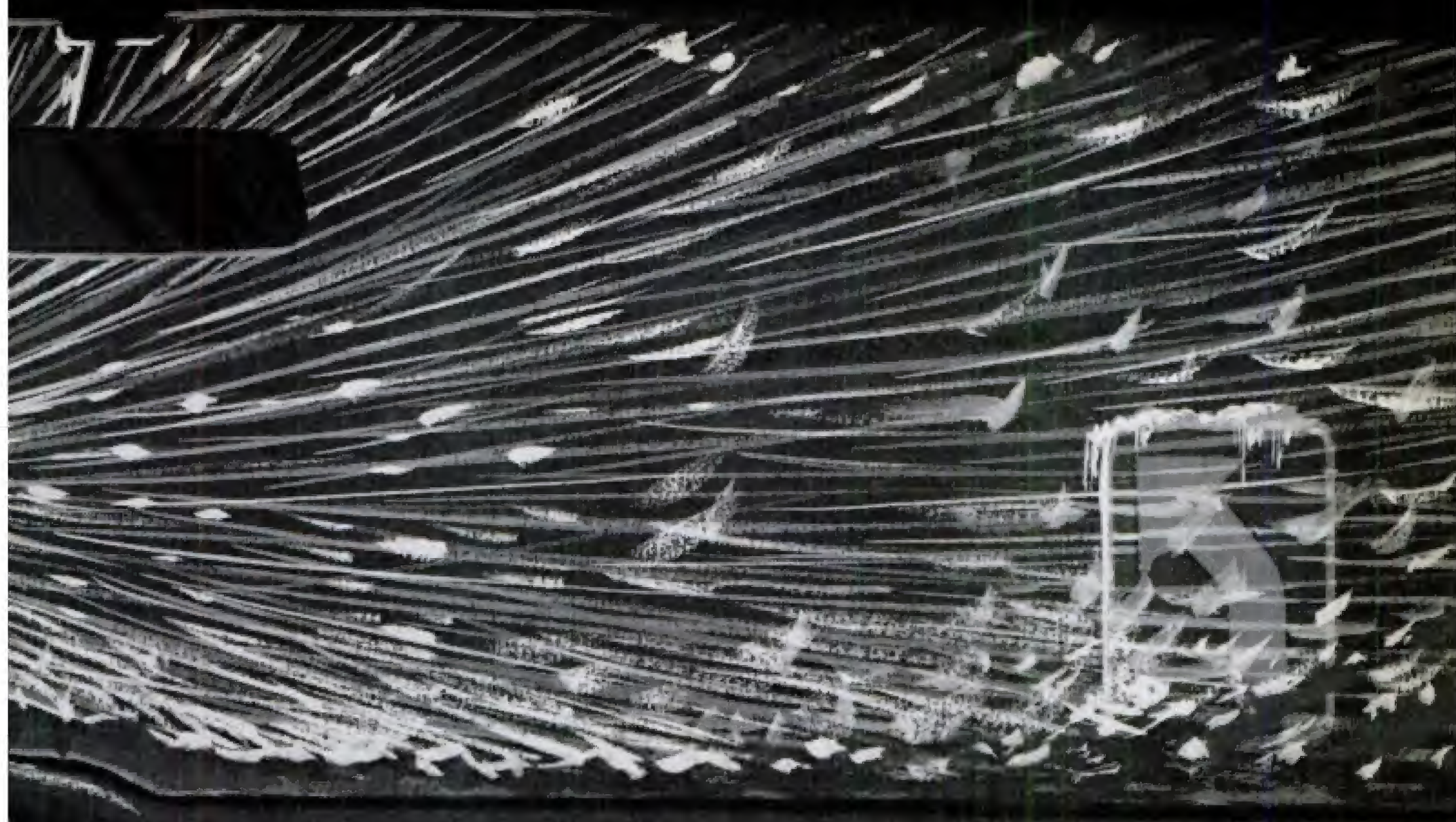
Can you cope with a sudden storm that swamps your defrosters, freezes your windshield? Can you keep going when other cars slither? Do you know what to do when the road vanishes in a "whiteout"?

In the high country above Idaho Spring, Colo., there are a few snow-driving experts who can keep going

when just about everyone else can't. How do they do it? To find out, I drove the high Rockies last winter with some of the best drivers in the Colorado Highway Dept.'s winter-maintenance and plow patrols. These men—supervisors, patrolmen and plowmen—*have* to keep going, even in terrific storms.

One is a slim, weatherbeaten road boss named Pat Murray, dean of the department's snowdrivers. His eyes are edged by wrinkles from hundreds of storms on the dizzy, sheer, 11,000-foot Berthoud and Loveland Pass routes. Another is Burr Hartman, a 19-year snow-buster up top. Besides riding with Pat and Burr, I rode with plow crews in whiteouts so thick we couldn't see the edge of the road. And below





# a Blizzard

that edge lay a mile of nothing. These men *have* to know all the tricks. Here are a few that see them through.

● *Cold storm, cold windshields:* One mistake that gets drivers in trouble, Pat Murray says, is running with defrosters turned on in cold storms. To Pat a "cold storm" is when the mercury drops below 25° F. (Anything else is a "warm storm.") "If you leave cold snow alone," Murray says, "it bounces off your windshield. But if you use defrosters, it melts, then forms ice. It soon becomes a solid mass that creeps under wipers and takes over."

When it's below 25, Pat and Burr never warm up a car or its engine before starting. They want everything as cold as possible. "Sometimes we even leave a window open in zero weather to cool all the glass," they say. Even with defrosters off, they lay cloth pads over closed defroster vents to kill the trickle of warmth that leaks through.

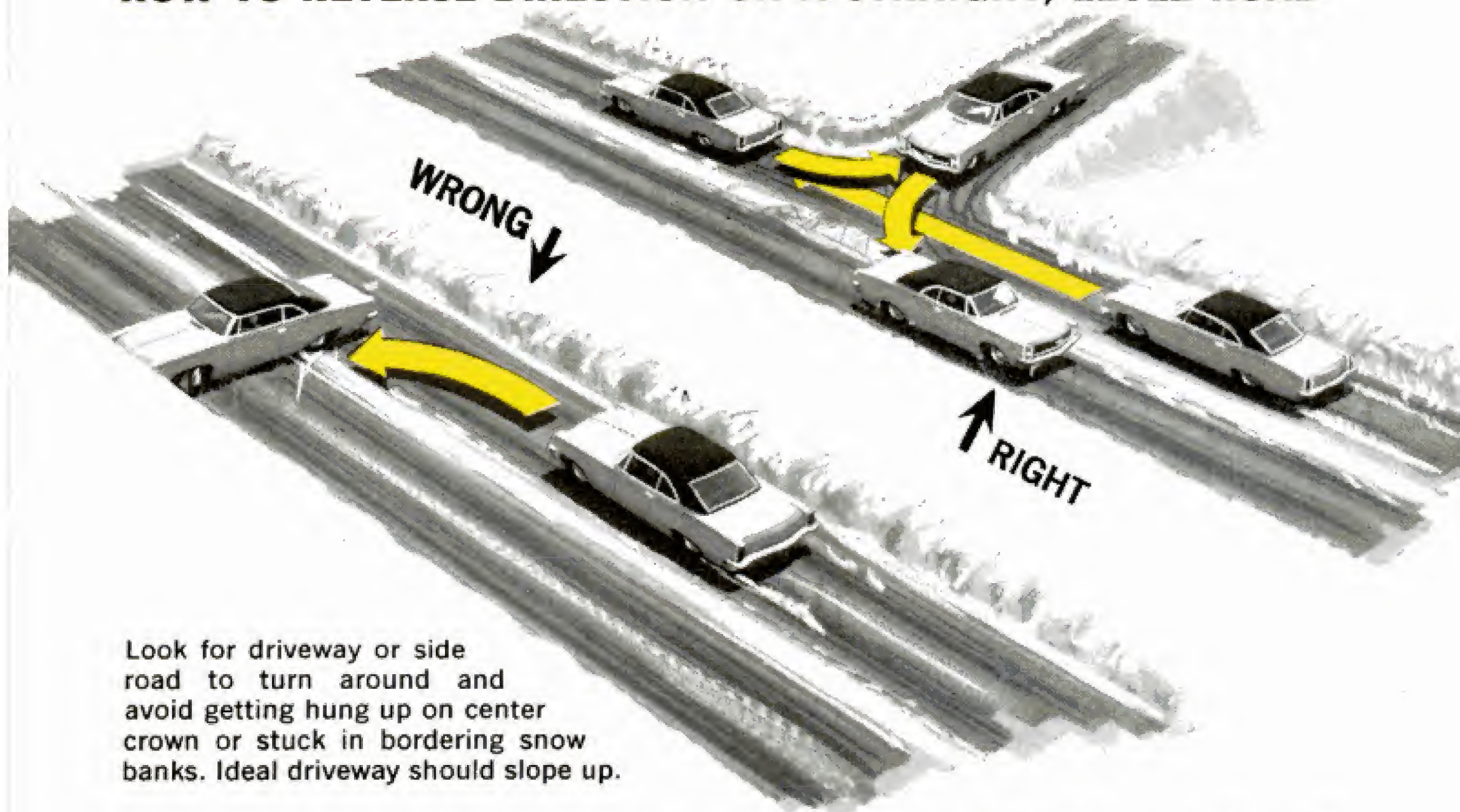
● *Warm storm, warm windshield:* But when the mercury is 25 or over, they keep windshields *hot*. Then they warm up for some time before starting, use full heat and blower. "We even try to get the windows warm," Pat says. "In a storm you've not only got to see ahead, you have to see on both sides and to the rear."

● *If you do ice up:* "The guys we find in the ditch," Burr Hartman says, "are peephole drivers. When defrosters can't keep up with the storm, they scrape a hole in the windshield ice. No one can drive that way. You lose all sense of feel. To keep control in a snowstorm, you need wide-track vision."

When a windshield ices up, a careful driver stops and scrapes it. But this can be dangerous. Where do you stop on a fast, slushy superhighway when escape shoulders are piled high with plowed snow, and there's no exit for 20 miles? Even if you *do* find a place,



## HOW TO REVERSE DIRECTION ON A STRAIGHT, LEVEL ROAD



Look for driveway or side road to turn around and avoid getting hung up on center crown or stuck in bordering snow banks. Ideal driveway should slope up.

what happens if your windshield immediately ices up again because there's freezing rain in the snow? To cope with this problem, Pat Murray has his own trick. Choosing a safe stretch of road, he slows down, sets hazard flashers going, then opens the window. Steering carefully with one hand, he reaches out around the windshield frame with a small plastic scraper and chips away at the ice.

It's not as hard as it sounds. The trick is to loosen the build-up of thick ice that forms at the left edge of the wiper sweep area—where blades are ineffective and defroster heat seldom reaches. Luckily, it's right next to the frame and within easy reach. Between each blade sweep, Pat gets in one or two quick digs at this "key ice." That's usually all it takes. Suddenly the ice floats free, the blades break it up, and the windshield is clear.

Dangerous? Sure, but you're in far more danger if you stop on a highway, or try to drive half-blind.

But suppose the blade also ices up? Pat's trick is to reach around the corner post, press two or three fingers tight to the windshield and let the end

of the blade run right over them. His fingers flex the blade, break away the lumps. In a few seconds, most of the blade is clear. If small lumps remain frozen to the back of the blade, it's important to remove them. If you don't, new ice will form and spread. "Frisk" the blade lightly, on each sweep, between thumb and fingers. It's easily done, but be careful not to hold the blade still or dislodge it.

Burr Hartman showed me another trick that helps. On many cars, four wires lead to the wiper motor. One is the "return" wire that parks your blades at the bottom of the windshield whenever you turn off the switch. If you disconnect the return wire, you can use the switch to stop the blade in any position. If you stop it at the left side, it's more easily "frisked."

● *The match trick:* When defrosters can't cope with ice, open the engine hood slightly, stuff one or two folded matchbooks under the trailing edge, then close the hood. This opens a crack about a foot long and a half-inch wide between hood and cowl. The engine fan will blow a steady stream of heat through

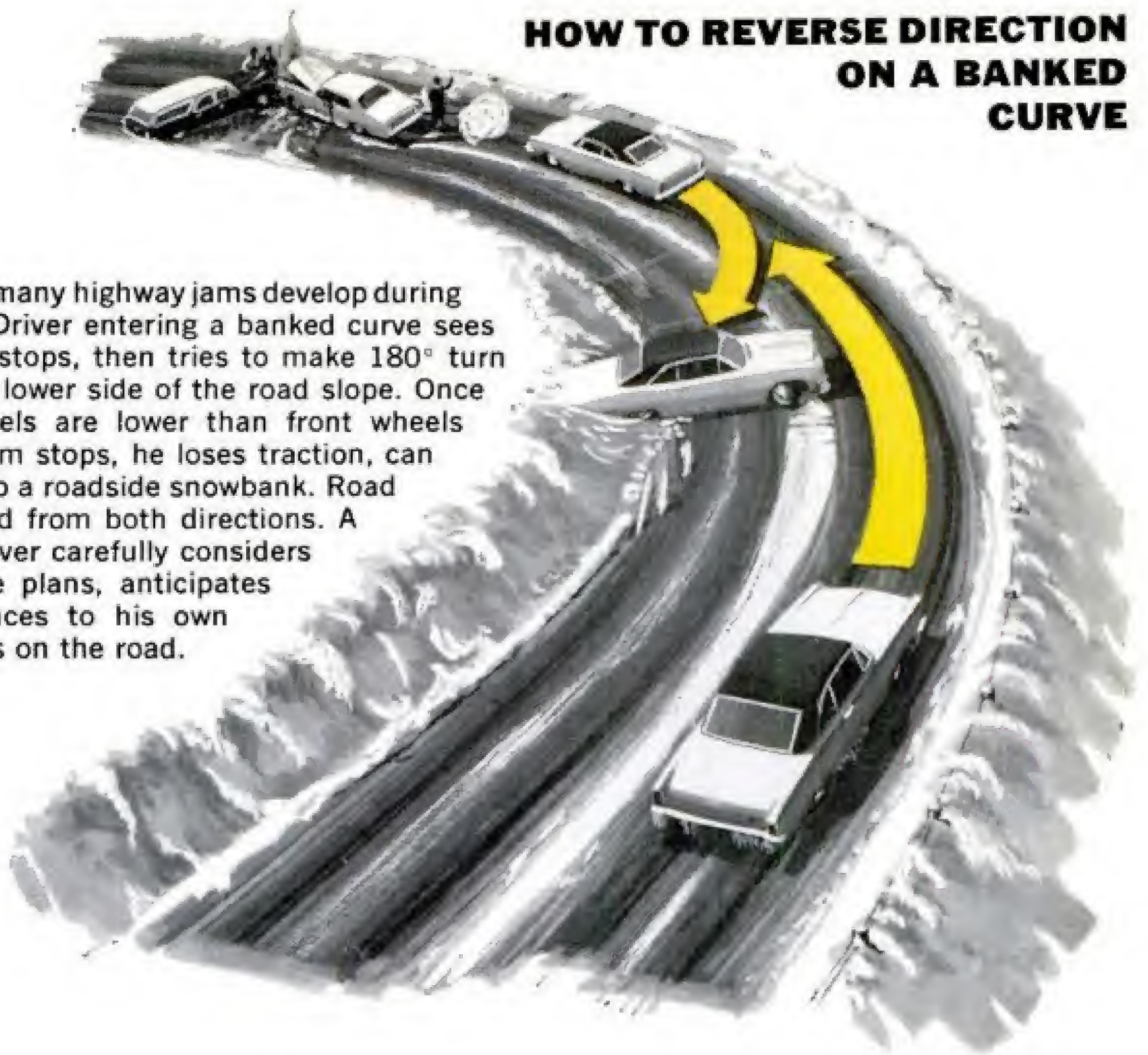
*(Please turn to page 214)*



## HOW TO REVERSE DIRECTION ON A BANKED CURVE

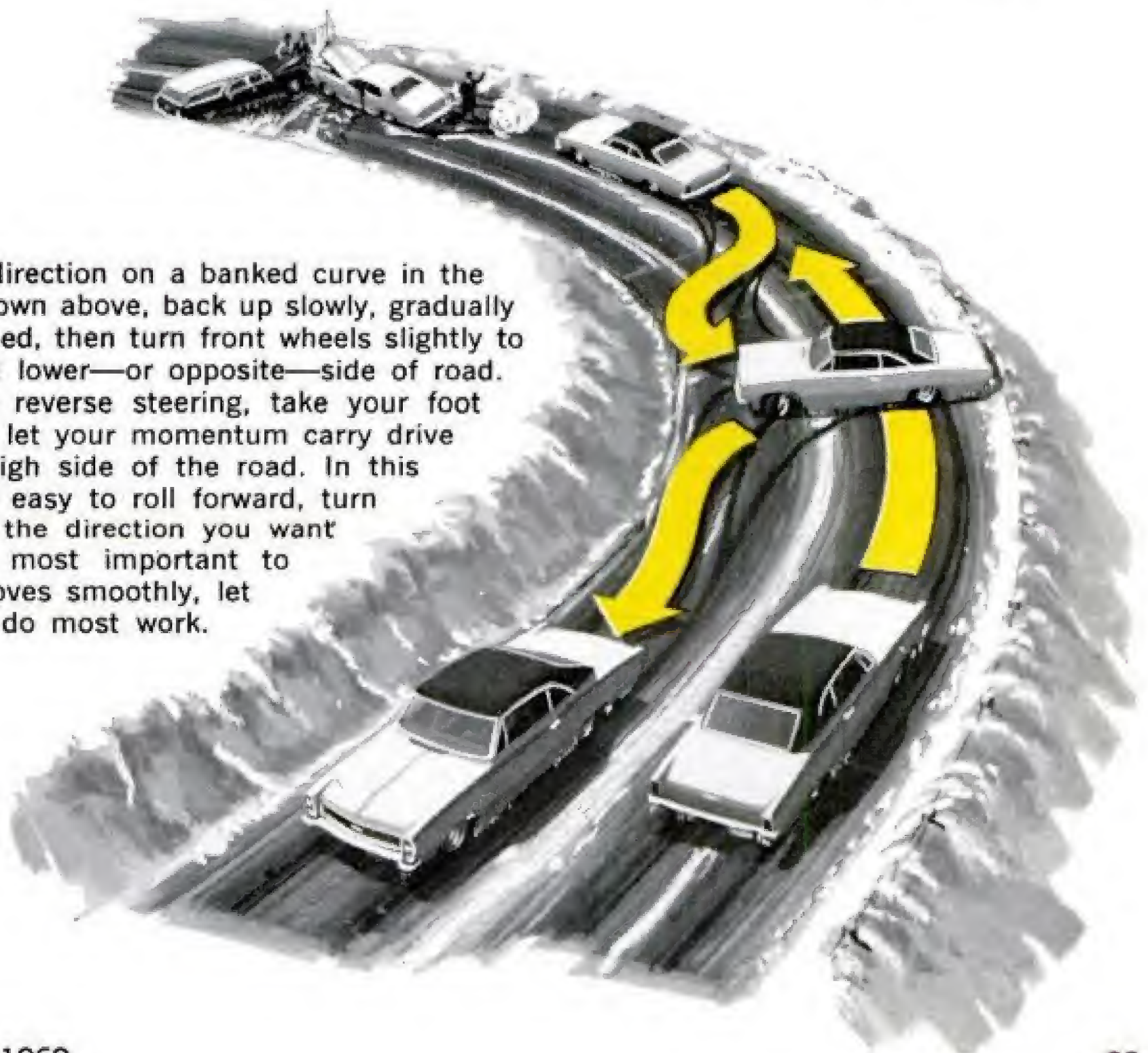
### WRONG

Here's where many highway jams develop during snowstorms. Driver entering a banked curve sees tie-up ahead, stops, then tries to make 180° turn by backing to lower side of the road slope. Once his drive wheels are lower than front wheels and momentum stops, he loses traction, can easily slew into a roadside snowbank. Road is now blocked from both directions. A good snow driver carefully considers each move he plans, anticipates its consequences to his own car, other cars on the road.



### RIGHT

To reverse direction on a banked curve in the situation shown above, back up slowly, gradually build up speed, then turn front wheels slightly to steer toward lower—or opposite—side of road. Immediately reverse steering, take your foot off the gas, let your momentum carry drive wheels to high side of the road. In this position it's easy to roll forward, turn your car in the direction you want to go. It's most important to make all moves smoothly, let momentum do most work.





# Queen Elizabeth 2

From her 67-foot funnel and computerized bridge to her twin six-blade screws, the QE2 is different. Gone are the dowagers and potted palms—the Queen is now a swinging seagoing resort city



**S**HE'S NOT THE BIGGEST or the fastest, but in this age of air-travel she's causing a lot of excitement. She's Cunard's latest: the *Queen Elizabeth 2*, heralded as the ultimate deterrent against boredom at sea.

On Jan. 30, Americans will catch their first glimpse of the QE 2 as she sails up the Hudson. Above a slim, sleek hull, the superstructure appears dangerously high, but from the quarterdeck upwards, all structural work is in aluminum, saving over 1000 tons of top weight. The 963 feet of hull are painted black and white: the white superstructure is accented with pale green. Topping the whole is the single 67-foot black-and-white funnel, a drastic change from the four, three and two stacks of the *Mauretania*, *Queen Mary* and *Queen Elizabeth*.

At first sight, it may seem extravagant to replace the *Elizabeth*—sold for \$7,800,000—with a vessel 80 feet shorter and costing nine times as much. Can the \$72-million QE 2 make money? The answer, Cunard hopes, is yes, lots.

With 30 years' technological advance since the building of the *Elizabeth*, it's now possible to get the same performance out of far less massive machinery. The QE 2 carries the same number of passengers (about 2000) as *Elizabeth* and *Mary*. And she steams at Cunard's traditional 28½ knots.

But her gross tonnage is only 65,000 tons, instead of 84,000. Her two engines need develop only 110,000 shaft horsepower, instead of 160,000. Engineering staff number only 103—compared with 230 on the *Mary*. The three-boiler steam turbine setup demands



## By J. A. MAXTONE-GRAHAM



**QUEEN ELIZABETH 2**, which is two-thirds the tonnage of the original Queen, will carry the same number of passengers at the same speeds, but will do it on 600 tons of oil a day as against 1,300 tons for *Mary*

600 tons of fuel a day. The *Mary* had 27 boilers, and a greedy thirst for 1300 tons of oil. The fuel saving alone amounts to \$12,000 a day.

Throughout the vessel, every conceivable modern device has been used to increase economy, comfort and safety. The use of 1000 tons of aluminum meant sending 80 welders to school to learn a special welding technique. Much of the metal was prefabricated ashore and hoisted aboard, like the 13½-ton, twin-staircased structure of the ballroom.

The ship's hull is studded with thousands of electrodes, flush with the welded steel plates. A small current confines corrosion to replaceable electrodes—while the hull stays unpitted



**SINGLE FUNNEL** of new QE 2 (below) thrusts smoke far above passenger deck, unlike earlier Queen, whose smoke often dipped to annoyingly low levels. Other vents in funnel discharge below-deck odors





**MAIN CONTROL ROOM** features pushbutton consoles that direct electrical distribution, power supply, air conditioning, stabilizers and other major mechanical operations



**BULBOUS BOW** on QE 2 will be another first on new 65,000-ton passenger ship. It helps make luxury liner the fastest twin-screw liner in world. Inside the bow are 27 vats containing ship's supply of draft beer—13,000 gallons

by rust and free from unnecessary drag. Stabilizers—with the optional use of two fins or four—cut a  $20^\circ$  roll to  $3^\circ$ , and give the smooth ride that a first-class passenger should expect for \$500 or \$1000. And the six blades of the two propellers will cut vibration to a minimum. The nut to secure one of these 19-foot-diameter giants itself weighs a ton and a half.

The QE 2 should be the safest ship afloat. One new department, permanently staffed by two men, is the safety control room. From two gleaming consoles they can operate all 58 watertight and 359 fireproof doors (all of which can also be worked locally).

Should smoke be detected in any part of the holds, a touch of a button squirts carbon dioxide at the right spot. A vast panel covered with hundreds of blue, red, yellow and green telltale lights gives instant checks on the working of every safety device on each of the 13 decks. Safety control can also put into operation an elaborate pumping system in case the hull should be punctured: Water can be quickly pumped across to empty tanks to give a maximum list of only  $7^\circ$ .

Twenty fiberglass lifeboats will let all 3000 persons aboard get clear within half



**MAIN-GEAR TEETH** get some last-minute "dental" work at the factory before wheel's installation on the QE 2 at Scottish shipyard. Main-gear wheel weighs 50 tons, has a diameter of 15 feet



an hour. Two of these—painted red—are specially designed for "ambulance work" in mid-ocean; for example, to take a sick man off a doctorless merchantman. For delicate maneuverability in high seas, they're propelled by water-jets.

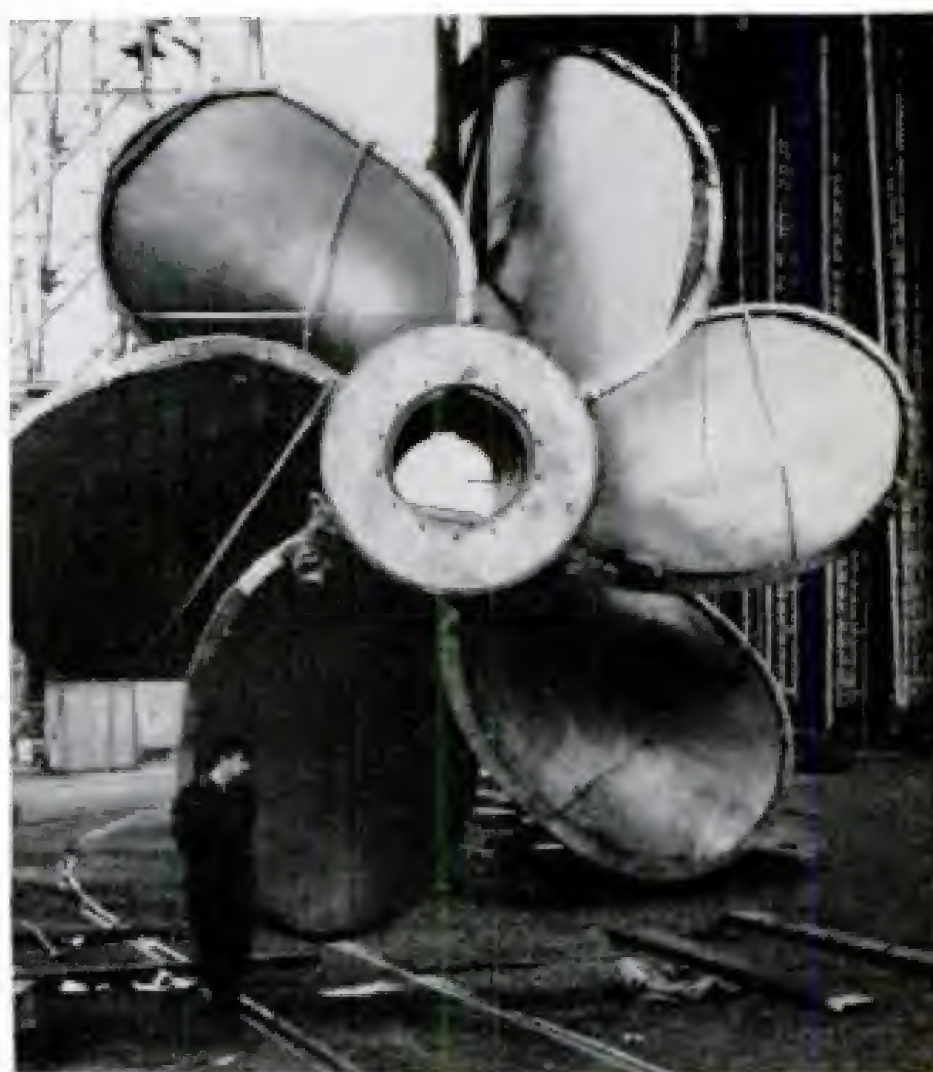
The perils of docking without tugs (in time of strike, for instance) have been reduced by two powerful bow thrusters—nicknamed the "Frothblowers"—controlled from the bridge. At the touch of a button, the skipper can turn on a 1000-hp motor driving a four-bladed, 6½-foot-diameter propeller that shoots out a powerful jet of water 20 feet below the waterline and forces the bow sideways towards her berth with all the power of a medium-sized tugboat.

No longer need a ship carry several massive funnels to prove her power and majesty. The QE 2's single stack is functional, not ornamental, and the result of 20 different attempts to get the right answer. Rigorous wind-tunnel tests revealed the perfect design, one that would take exhaust gases up and clear of the decks—whatever the wind direction. The tall stack contains three tubes to handle engine-room smoke; the white attachment behind is an outlet for used air from the rest of the ship. (Ugly exhaust cowls no longer disfigure the decks.) Two ramps curve up to the funnel; when the ship travels at speed, these guide a strong draft of

[\(Please turn to page 232\)](#)



**QE 2 STABILIZERS** are also new, swinging forward into hull when not in use, instead of retracting, thus cutting down necessary storage space inside hull



**SIX-BLADED SCREW** is one of two on new liner, and largest ever fitted on twin-screw ship. Four were made, with two held in reserve as emergency spares



# 'Sizing Up' The 1969 Station Wagons

It's easier than ever to pick the perfect wagon to fit the family, lug packages and pets, and still get sports appeal

By **BILL HARTFORD**,  
Associate Auto Editor

*Photos by Irving Dolin*



**SMALL** In class of its own, Rambler 440 wagon has 106-inch wheelbase, a true compact, yet with size advantage over imports

**W**HAT MAN could possibly get enthused about buying a "school bus" for the kids, a "shopping cart" for the wife, a square box on wheels? It's impossible—until you discover it's also impossible to squeeze *your* 125-hp outboard into the fastback's "trunk"; or until you find yourself fearing for the kids' spinal columns as they bounce along bent over in the back of *your* sporty little car; or until you take a close look at some of the latest station wagons from Detroit.

First glance at the extremely sophisticated, simulated wood-paneling job on these machines should conjure up all the romance of the wood-bodied sporting wagonettes of yore. Once

known as a "shooting brake" (brake being a carriage chassis that was harnessed to spirited horses to "break" them), the turn-of-the-century wagon was an open carriage with bench seats that carried shooting parties on large estates. As it became an all-purpose vehicle for conveying master and servant alike, the wagon became an "estate car" and that is still the British terminology for the station wagon.

Here at home, a lot of cars rolled off the line before the 1923 wood-paneled Durant became America's first production station wagon—and many more have rolled off since 1940 when the almost-classic, wood-sided wagon was the only one among every 100 cars pro-





**MEDIUM** Representing intermediate-size wagons is Pontiac Le Mans with 116-inch wheelbase. Bumper cutout step is new

**BIG** Full-size family wagons are represented by 121-inch-wheelbase Ford LTD Country Squire. Air deflector is part of the luggage rack

**WAGON LINEUP**—Rambler 440, Pontiac Le Mans and Ford Country Squire—illustrates size jump from Rambler's 66 cu. ft. of cargo volume to Pontiac's 83.1 cu. ft. to Ford's 96.2 cu. ft., the last two volume figures typical of intermediate and full-size wagons. As size goes up, so does the availability of comfort, convenience and trim options—and so does the price. ([See chart, p. 106](#))





# 1969 STATION WAGONS

	MAKE	MODEL	WHEEL-BASE (in.)	CARGO AREA DIMENSIONS				3RD SEAT	2-WAY TAIL GATE	MFR'S PRICES START:
				max. length (in.) <sup>o</sup>	min. width (in.)†	max. ht. (in.)	vol. (cu. ft.) ‡			
SMALL	American Motors	Rambler 440	106	76.78	41.8	29.69	66	No	No	\$2478
MEDIUM	American Motors	Rebel, SST	114	92.63	45.08	31.72	91.12	Yes	Yes	\$2817
	Buick	Special Deluxe	116	90.9	44.5	31.5	83.6	No	Yes	\$3075
	Chevrolet	Chevelle Nomad, Greenbrier, Concours Estate	116	90.9	44.5	31.6	84.0	Yes	Yes	\$2651
	Dodge	Coronet Deluxe, 440, 500	117	91.7	45.3	31.2	84.9	Yes	Yes	\$2905
	Ford	Falcon, Futura Fairlane, 500, Torino	113	89.0	42.6	32.7	85.2	No	Yes	\$2643 \$2824
	Mercury	Montego MX	113	89.0	42.6	32.7	85.2	Yes	Yes	\$2962
	Olds	F-85 Cutlass	116	90.9	44.5	31.6	86.1	No	Yes	\$3038
	Plymouth	Belvedere Satellite	117	91.7	45.3	31.2	84.9	Yes	No Yes	\$2862
	Pontiac	Custom S, Le Mans	116	90.9	44.5	31.3	83.1	No	Yes	\$2939
	American Motors	Ambassador DPL, SST	122	92.63	45.08	31.72	91.12	Yes	Yes	\$3504§
BIG	Chevrolet	Brookwood, Townsman, Kingswood, Kingswood Estate	119	96.0	49.7	30.7	100.2	Yes	Yes	\$3047
	Buick	Sportwagon	121	96.1	44.5	34.1	96.3	Yes	Yes	\$3448
	Chrysler	Town & Country	122	98.98	48.5	29.04	93.1	Yes	Yes	\$4566
	Dodge	Polara, Monaco	122	98.98	48.5	29.04	93.1	Yes	Yes	\$3505
	Ford	Custom 500 Ranch Wagon, Galaxie 500 Country Sedan, LTD, Country Squire	121	92.4	48.7	31.6	96.2	Yes	Yes	\$3074
	Mercury	Monterey, Monterey Custom, Marquis Colony Park	121	92.4	48.7	31.6	96.2	Yes	Yes	\$3519
	Olds	Custom Vista Cruiser	121	96.1	44.5	34.5	100.5	Yes	Yes	\$3440
	Plymouth	Fury Suburban, Custom Suburban, Sport Suburban	122	98.98	48.5	29.04	93.1	Yes	Yes	\$3214
	Pontiac	Catalina, Executive Bonneville	122	93.7 93.5	48.9	30.6 30.3	91.7 90.8	Yes	Yes	\$3502

<sup>o</sup>Measured at floor with tailgate closed.

†Measured between wheel housings.

‡Does not include underfloor storage where available.

§Airconditioning standard; automatic transmission standard on SST.

duced. It was hardly a popular body style at that time, but the traditional use of wood or wood-grain applique has been popular ever since.

Today, roughly one of 10 cars off the line is a station wagon. These wagons won't fill your nostrils with the tang of rich leather or real rubbed wood, and they won't excite you as would a GT, but they will be to the family man or sportsman, the best *Gran Turismo* of all—offering Grand Traveling in comfort, convenience and style.

Station-wagon style, as is quickly evident, follows that of the production sedan of which it is the counterpart. Most are on the same wheelbase, offer the same engine and transmission options, and the same comfort and convenience options, plus those unique to wagons.

If you select the "usual" options—

automatic transmission, power brakes and steering, larger engine than standard, maybe a radio, and some extra trim, tinted glass and some other irresistible—plus the wagon options—two-way tailgate with power window, third seat, optional tires, heavy-duty suspension, factory rack, maybe some "yacht-deck" wood trim—you can figure on going \$500 to \$1000 over suggested retail for the manufacturer's bottom-priced wagon in the intermediate line and an easy \$1000 over in the family wagons.

With an intermediate-size wagon, don't expect to lay out 4x8-foot panels. Width between wheelhouses is less than 46 inches. Passenger seating for eight, however, is possible in those wagons offering a third seat option. Figure paying about \$100 extra.

Cargo space in the Rebel wagons is





**TWO-WAY TAILGATE** hinging at side or bottom is standard on many wagons. Ford's Magic Doorgate, shown here, is the only "fifth door" that is operable with the rear window fully up



**FACTORY RACKS**, some adjustable to secure various size loads quickly, may seem to be an expensive option, but are sturdy, streamlined—a must for full use of a wagon



**UNDERFLOOR STORAGE** offers bonus cargo-carrying capacity. The hatch on some wagons can be locked. Handle is recessed for flat floor

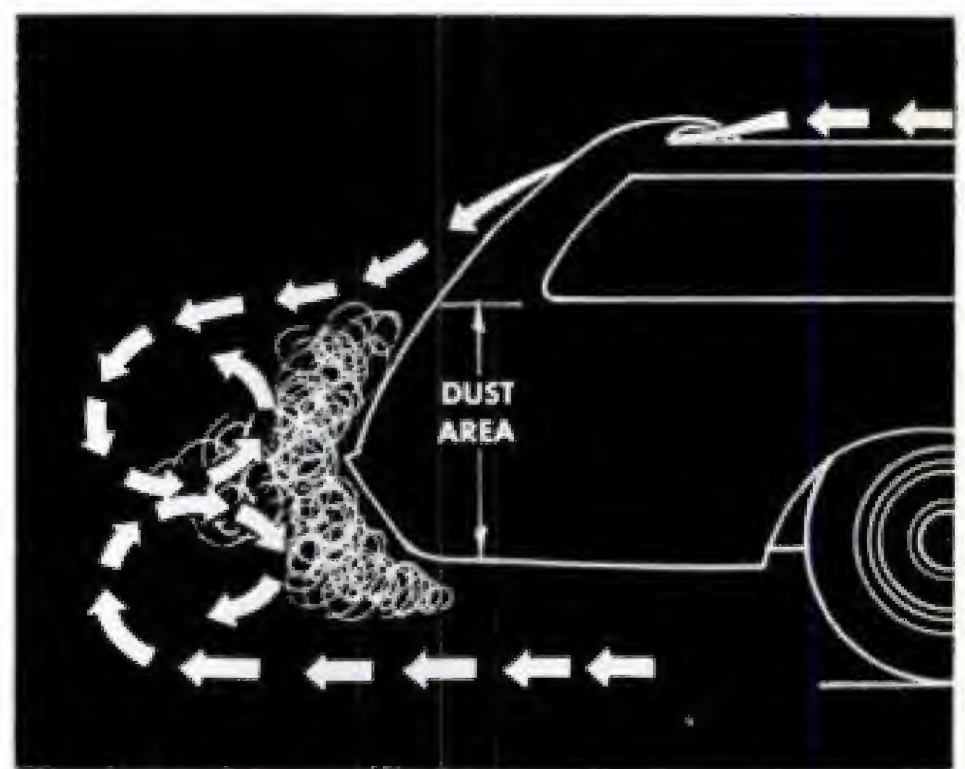
impressive, but it is the same in the longer-wheelbased Ambassador. Falcon and Fairlane wagons, too, have the same cargo area dimensions and, both on a 113-inch wheelbase, are medium-size wagons.

In the family-size wagons, Buick and Oldsmobile continue to offer tinted-glass roof panels for Vista Cruising. Dual-action tailgate, Drop-or-Swing, call it what you will, is available across the board; standard on some models, about \$50 when optional. Power tailgate window, a very desirable option, is usually \$40 to \$50 extra.

The Ford Magic Doorgate is the only tailgate that can be opened as a door with the window up—a bonus feature. On medium and large GM wagons a new cutout in the rear bumper forms a convenient step for passengers.

Dodge and Plymouth wagons include as standard on some models, an integral air deflector which is exceedingly effective in keeping the tailgate window clean. Passenger handles on either side of the tailgate opening give a long overdue helping hand. The Chrysler Town and Country sizes up as the most powerful (440-cu.-in. V8 option), luxurious and expensive of all. And at 224.9 inches, it's the longest.

Long or short, the '69 wagons have a lot more than just size to meet the eye. Take a look. ★ ★ ★



**AIR DEFLECTOR**, built into roof line of Chrysler, Plymouth and Dodge models, aerodynamically lowers dusty low pressure area to keep rear window clean. Cars also offer hidden wiper-washer in tailgate



**THIRD SEAT**, whether it faces forward, aft or is actually a pair of facing seats, as shown here, is available on all large wagons, some intermediates



THE WHEEL is about 30 feet in diameter and has 10 sand-scooping buckets and 10 bottomless "bows"

# THEY'RE MINING OIL WITH BUCKETS

By DAN FALES

*Photos by Black Star*

**T**HE WHEEL is what they call it. The machine stands 100 feet high, 200 feet long, weighs 1600 tons, handles 50,000 tons of sand a day, travels 23 feet a minute, and is being used to mine oil.

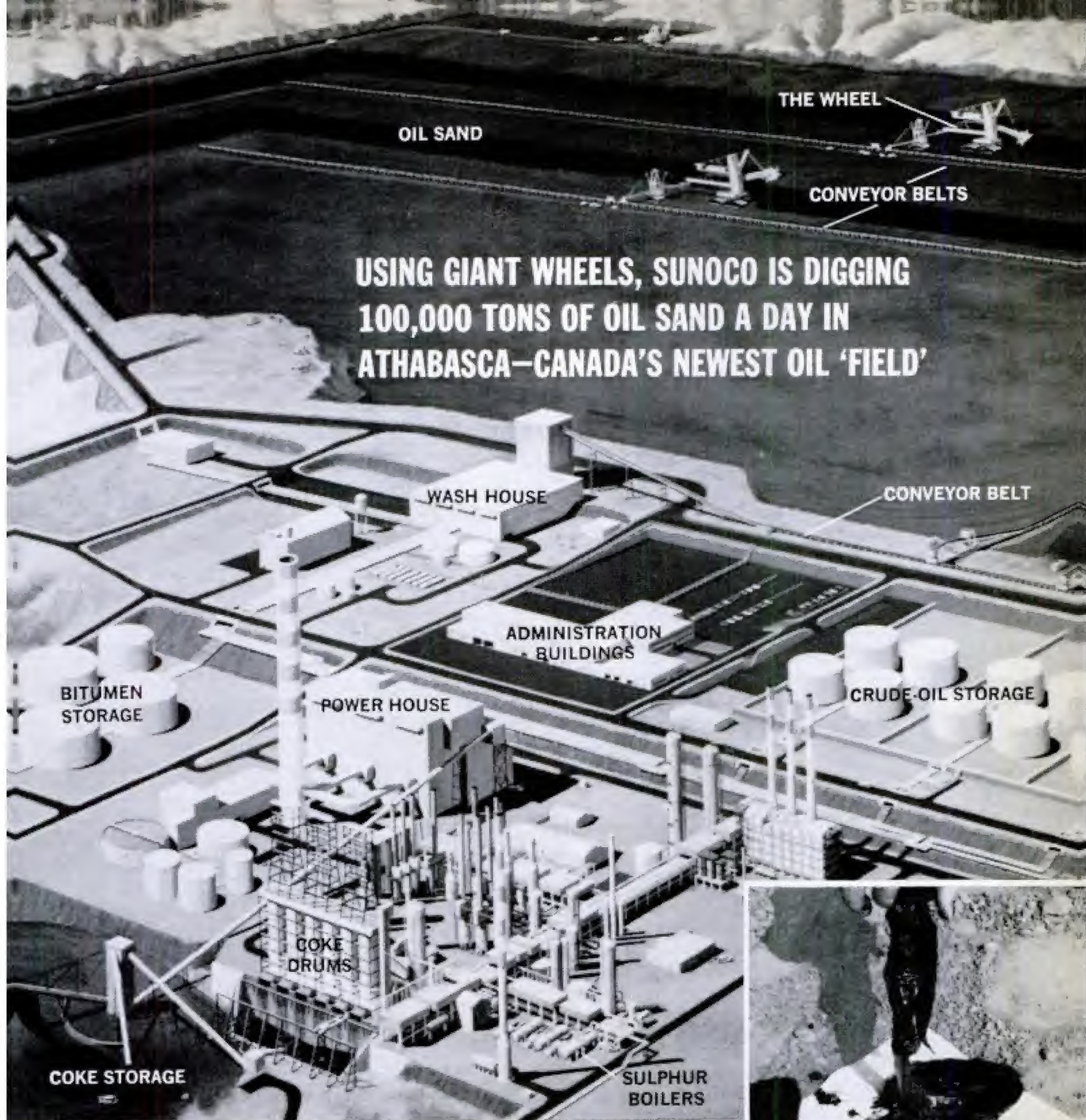
Actually, the wheel is one of two being used by Great Canadian Oil Sands, Ltd., to process 100,000 tons of oily sand a day. It's all happening 600 miles south of the Arctic Circle in the Athabasca area of Alberta, Canada. In this spot, nature deposited an oily "beach" which,

if man-made, would be a pollution problem. But here G.C.O.S. will get 45,000 barrels of oil a day. Also from the oily sand will come coke, sulphur, naphtha, gas and clean fine-grained sand.

This type of oil operation is really strip mining. But there's one big difference. Once the oil has been washed from the sand, the sand is replaced, then planted leaving no gigantic scars in the earth.

Great Canadian Oil Sands, connected





## USING GIANT WHEELS, SUNOCO IS DIGGING 100,000 TONS OF OIL SAND A DAY IN ATHABASCA—CANADA'S NEWEST OIL 'FIELD'

**IN PROCESSING PLANT**, oily sand is conveyed to wash house where bitumen is floated from sand and processed. Coke, a byproduct, fuels powerplant with Sun Oil Co. of Philadelphia, Pa., is mining the oil under a lease from the Canadian government.

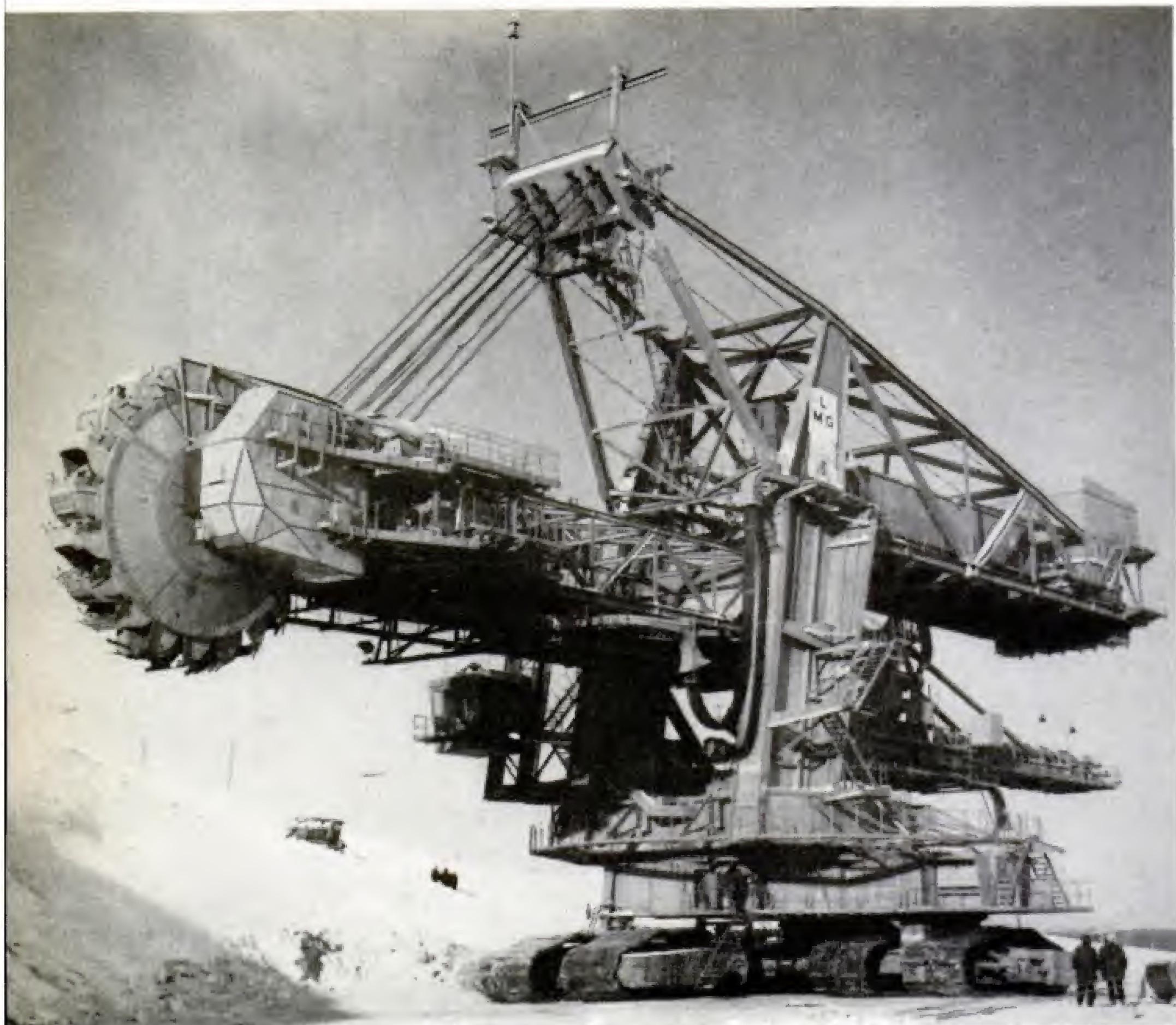
Here's how the mining operation works. The giant machines scoop up oily sand—about 9000 tons an hour. Three men ride each of the two—one operator, one belt man, one observer. The wheel, about 30 feet in diameter, has 10 buckets that hold sand and 10 "bows"—bottomless buckets that break the sand loose. Sand is dumped on conveyor belts running to a washing area.

Here, the gunky oil called bitumen is floated free of the sand in hot water and then sent through an initial cracking process producing fine crude oil. Byproducts



**OILY SAND** (left) yields a tar substance called bitumen (center) and clean sand (right). The bitumen is treated to produce crude oil, coke, sulphur. Crude oil is pumped 250 miles to refinery, while clean sand is used to fill the excavation





**THE WHEEL'S CONTROLS** are in operator's box below front arm. Anemometer warns of belt-flapping winds



**OPERATOR** can swing, raise or lower the wheel. Wheel works in semicircle as entire machine moves

are then tapped off the oil. One important one is coke. The coke is used to fire the boilers in the electric generation and heat plant. This power is used to run the entire mining operation.

The final crude oil is pumped through pipes for 250 miles to central cracking plants in southern Alberta.

Saturated in the Athabasca area is enough recoverable oil to equal the total amount of oil known to be located in natural reservoirs in the Free World. That's about 300 billion barrels.

Why there's oil in the Athabasca sands is a mystery. Some say it leaked from a deep subterranean reservoir following massive earthquakes.

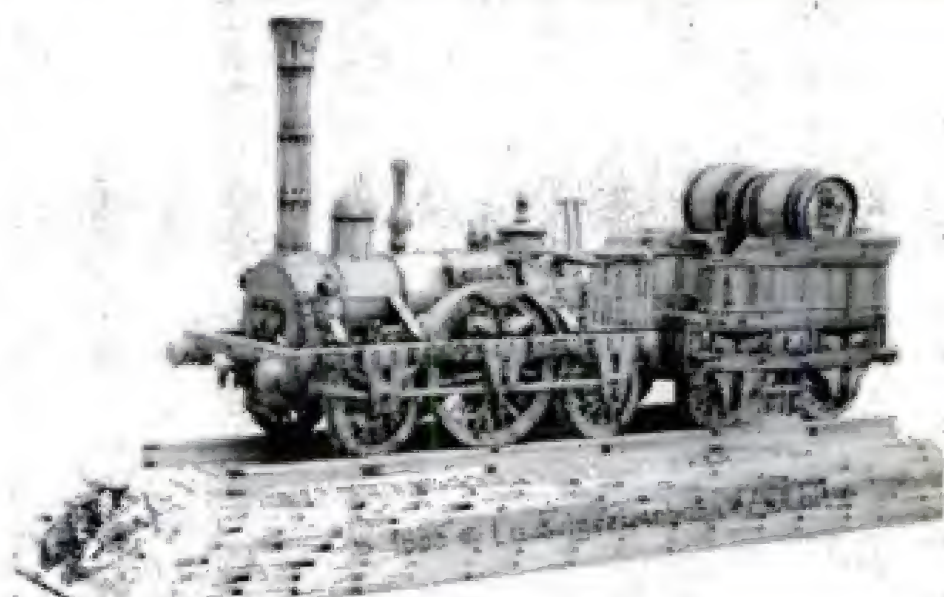
Others feel the oil was created in the area. In any event, there's enough oil in this area to last a long time. ★★★





## Matchless match models

German engineer Fritz Forster of Nuremberg has used up 60,000 wood matchsticks in the past eight years producing scale models of vintage cars and locomotives as a hobby. Unlike many matchwork models, all of his 69 intricately detailed creations have wheels that turn and other moving parts.



## No pitter-patter here

Looking vaguely like a beached whale, Chicago's new Center for the Performing Arts wears an outer skin of sheet lead, chosen to deaden the sound of rain and hail. The unusual saddle-roofed structure houses a 600-seat theater and TV station WFLD, making good soundproofing a must. Detail photo (above) shows standing seam between panels.





### Swiss summer job: Building protection against avalanches

Years ago, only a few daring farmers could be seen on the steep slopes of Swiss mountains, harvesting fodder for their animals. Now, workmen may be found on those slopes in the summer operating air drills and making giant barriers from reinforced concrete to hold or to divert avalanches. The work is difficult and dangerous. Often the materials—and even the men—must be brought to the barrier sites by helicopters. After holes have been dug and steel set in concrete, the barriers (far right) stand, protecting the valleys below.



### Pilot develops city car

This is the rear of a new "city car" developed by Mike Forrest, a former RAF pilot. The rear-facing back seat of the four-passenger car is one of several features he's designed to make the car his answer to city traffic problems. The front and back of the car are doors, so passengers can step directly out. A 750-cc engine propels the vehicle. The body is made of fiberglass, and the entire machine weighs 900 pounds. Main controls are incorporated in a single tiller.



### Aerobatic Nipper

The Nipper is a fully aerobatic British single-seater that comes in a do-it-yourself kit.



### Phantom for British fleet

Here's McDonnell-Douglas's F-4K Phantom dressed up for service with the Royal Navy.





## Department store railroad

One Tokyo department store has found a way to keep the customers' kids amused when they accompany their parents on a shopping tour. The youngsters are given rides on an electrically-driven scooter that runs the full length of the store. An engineer controls the speed of the toy.

FEBRUARY 1969



## Help for 'blue babies'

High-pressure oxygen in a hyperbaric chamber sustains the life of a "blue baby," giving doctors precious extra time to work under a fluoroscope that guides them in inserting a catheter into the newborn infant's heart to correct a valve defect. (See *High-Pressure Medicine*, page 99, Dec. PM.)

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**1908** | **CHRISTIE FRONT-WHEEL DRIVE**



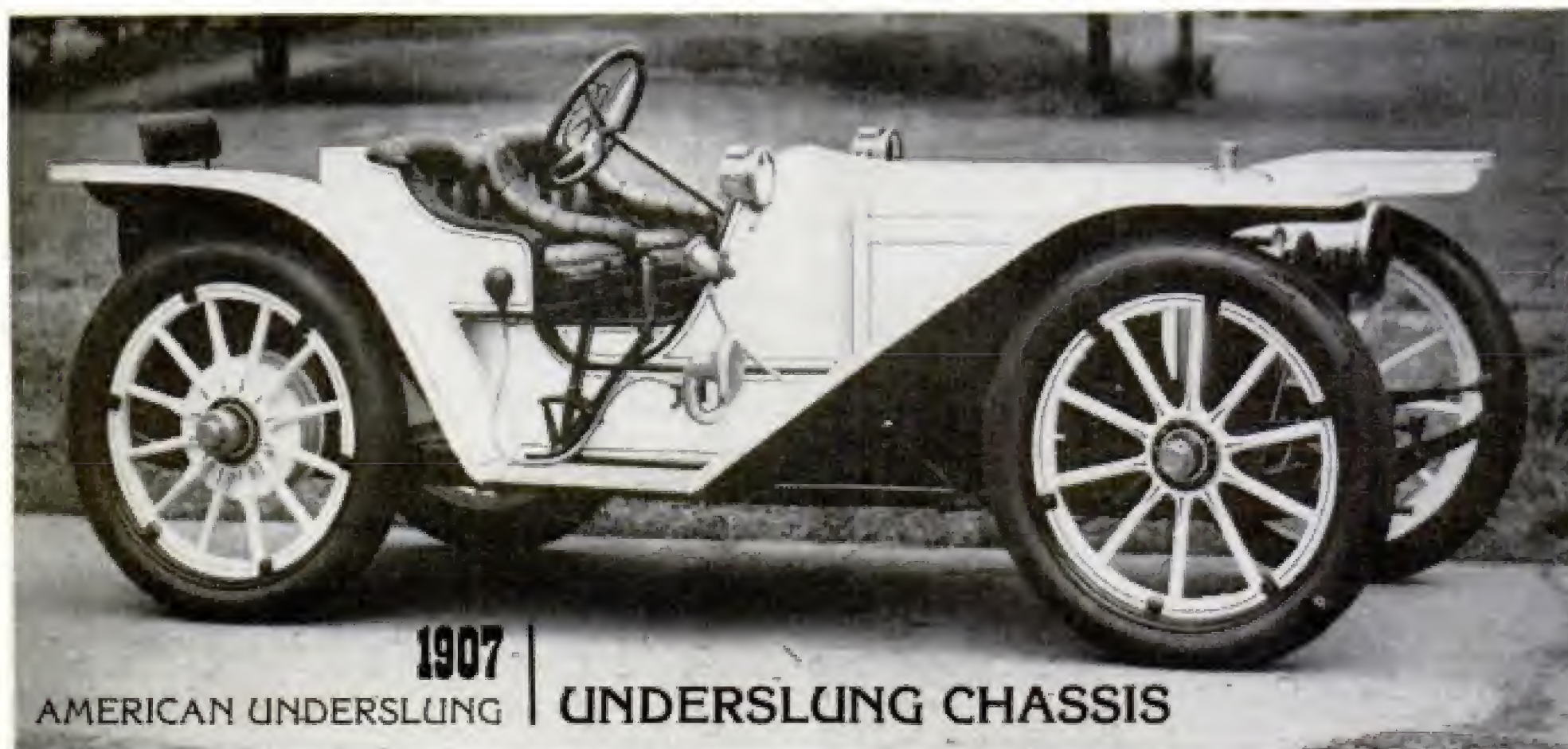
**1905** | **ROLLS-ROYCE V8 ENGINE**

## SO WHAT

▲ **RACING MACHINE** of J. Walter Christie design had front wheels driven by transversely mounted engine

◀ **ROLLS V8** was shown at London auto show—believe it or not—in 1905; its 3½ liters put out 20 hp

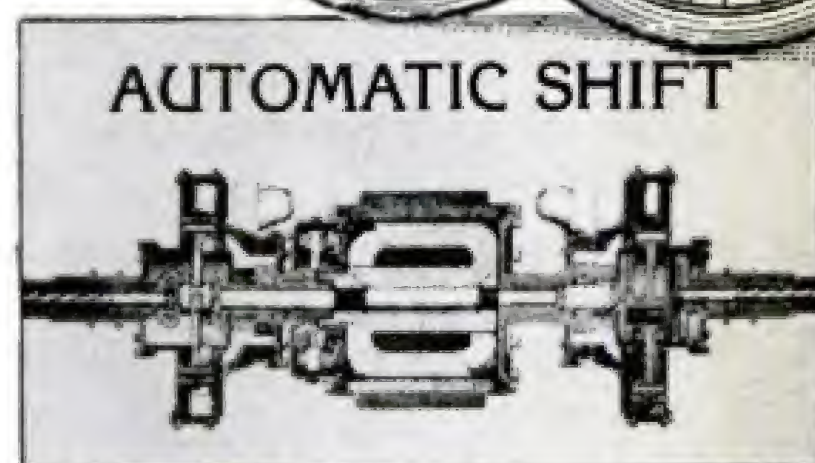
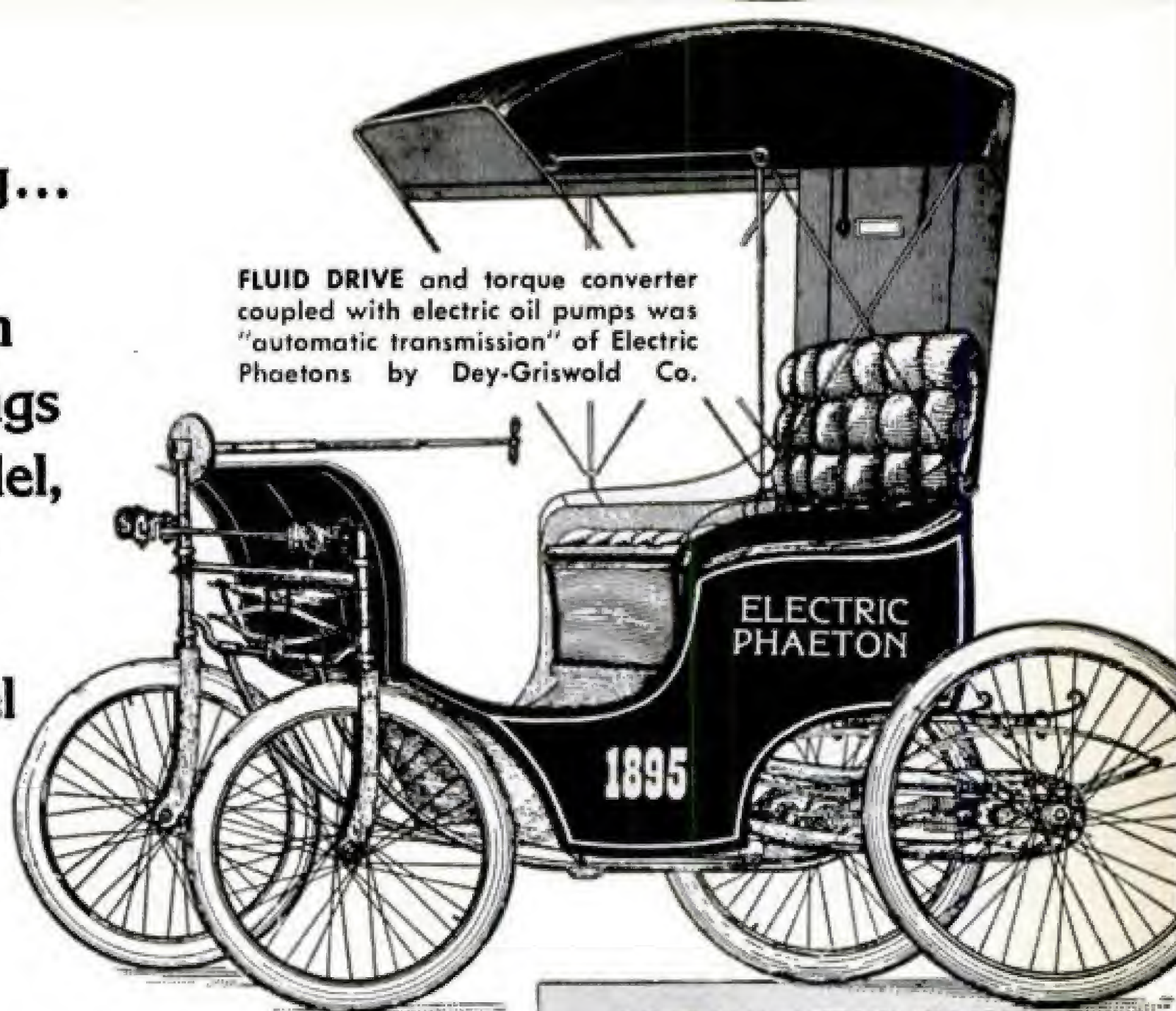
**GREAT ROADABILITY** from low center of gravity was early-recognized boon of chassis hung from springs



**1907** | **AMERICAN UNDERSLUNG CHASSIS**



The old cars  
had everything...  
an automatic  
transmission in  
1895, coil springs  
on a 1907 model,  
a V8 engine in  
1905.  
Your '69 model  
is 60 years  
old if it's  
a day!



# ELSE IS NEW?

By JOHN BENTLEY

**N**EW CARS AREN'T VERY NEW. Old-timers who witnessed the birth of this country's third largest industry and watched it grow from a handful of back-yard enterprises to a multibillion-dollar road transportation system, can tell you that. They smile at some of the advertising claims of today's automakers. Features described as "sensational," "entirely new," and even "years ahead of present design," all appeared at one time or another on some of the earliest models.

They appeared but usually didn't "make it." Most were dropped because of technical bugs, production problems and the like, or for the sound financial reason that the public was not yet "ready" to accept—or pay for—them.

Torque converters (automatic transmissions), the overhead camshaft engine, front-wheel drive and four-wheel

drive, the V8 engine, interaxial seating, coil suspension, underslung chassis, four-wheel brakes, the extensive use of aluminum in bodies and engines—you name it—all go back to the beginning of the century or even earlier.

● *Automatic transmissions.* The modern torque converter—or automatic transmission—provides a means of varying the ratio between engine and road-wheel speeds by utilizing a fluid coupling or turbine.

This idea was actually tried out in November 1895. That year, Harry E. Dey, president of the Dey-Griswold Co. of New York, worked out a "system for propelling streetcars and wagons." The Dey-Griswold Electric Phaeton had an electric motor with a revolving field and armature, each driving a shaft on which was fitted a radial oil pump with single-acting pistons. A special battery (Dey High Potential





## 1908 BADGER

**DEEP SNOW** was no problem for Badger, made by Four Wheel Drive Auto Co. of Wisconsin. Not many cars were made, but those that were became first successful vehicles with four-wheel-drive design

### 4-WHEEL DRIVE

Series Battery) supplied the current to the motor. When the current was switched on and the shafts began rotating, twin oil pumps forced oil along lines to miniature fluid gear turbines located on each rear wheel. Here is a contemporary description:

"If we come to a gentle grade, the motor automatically takes a little more current. If the grade gets heavier, more current comes. On a downgrade, the motor (now driven by the oil pumps on the overrun) changes to a dynamo and puts back current into the battery. The steeper the hill, the more the return, and at the same time the generator is acting as a brake. This is accomplished without once changing the handle..."

In today's torque converter, the turbine is not located on the driven wheels, but the fundamental idea remains unchanged.

To what extent the Dey-Griswold torque converter underwent practical tests has not been recorded, though

several models were actually built. Among other things, problems of heat dissipation almost certainly defeated the idea in its infancy, but the idea was there.

● *Front-wheel drive* in an automobile did not arrive with the Olds Toronado. In fact, it's more than 60 years old. In 1908, Walter Christie, founder and owner of the Christie Iron Works in New York, built a front-drive race car on the so-called modern "sidewinder" principle, with the engine transversely across the front. The car's name was Big Bear, and its huge four-cylinder, V-shaped power unit displaced 1220 cubic inches.

"If I succeed," Christie promised, "I'll have some front-drive cabs plying for hire on the streets of New York within a year. It's the toughest testing ground you could find."

He was true to his word. In 1909, a number of Christie front-drive cabs (with smaller engines but operating on

## 1910 | ISOTTA-FRASCHINI | 4-WHEEL BRAKES



**BRAKES ALL ROUND** were pioneered in Europe during first years of the century; and successful ones on the Isotta-Fraschini predated the wide-scale use of four-wheel brakes by years



exactly the same principle) appeared on the streets of Manhattan. Their reliability was, unfortunately, not equal to the appalling strain of cab work with its endless stops and starts; but the idea was considered good enough by fire departments of several cities which were persuaded to replace their antiquated horse-drawn fire engines with Christie front-drive units.

● *Overhead camshaft engines.* It is generally believed that Augie Duesenberg first put into production the overhead-cam engine when he offered his sensational new straight-eight Tourist Model (which included hydraulic four-wheel brakes) at the 1921 New York Show. In fact, the Duesenberg was at least 15 years behind the Ariel Automobile Co., Bridgeport, Conn., whose 1906 brochure contained some startling information. The actual photo of the Ariel's engine is a collector's item. It shows four separate, liquid-cooled cylinders with an overhead camshaft operating in the open, directly on the valves. No casing or protective cover. But under the photo we read: "The entire valve mechanism of the Ariel, being on top of the motor, is very accessible; all of which makes for reliability, as in two minutes one can inspect every piece of the mechanism on the motor without removing one's gloves."

The Ariel's 30-hp engine not only had a gear-driven overhead camshaft which put it "in a unique field of design," but also offered *interchangeable* valves, inclined at an angle of 30°. "No other manufacturer has so far come forward with so daring a design." Ariel

long ago went broke. Today, Pontiac is the only make which offers a production overhead camshaft engine in the United States, priced within reach of the average buyer.

● *V8 engine.* Cadillac is proud of pioneering the V8 engine in 1916, even though the mass-produced Ford V8 of 1932 really popularized the design. But, Rolls-Royce was way ahead of both when it exhibited a V8 engine at the London Olympia Automobile Show of 1905. This was a side-valve design with the cylinders set at 45°. Bore and stroke were 3.24-in. and the output was 20 hp at 2000 rpm. Ignition was by synchronized trembler coils. The cylinders were cast in pairs and mounted on a common crankcase.

A contemporary show report described the design as "most original. The impulses and compressions must necessarily overlap each other in a much more regular manner than is even possible with a six-cylinder motor, which type has been regarded as coming pretty close to perfection in this respect. Furthermore, an absence of noise is had from all cylinders because the moving parts are *very light*. The exhaust volume per cylinder is small and the almost continuous discharge is in itself an aid to muffling."

● *Coil suspension.* Coil springs up front were reintroduced to the American public as a "radical" innovation—a wonderful new idea, back in 1934. What people didn't know (and many still don't) was that this principle already was so old it was new again. Back in 1906—over 62 years ago—the

## 1933 PIERCE-ARROW

**AHEAD OF ITS TIME**  
is one way to describe the 1933 Silver Arrow. For the year, built-in headlights, no running boards, hidden spare wheels, recessed door handles, were big innovations.

FEBRUARY 1969



## STREAMLINING



Brush Runabout had coil springs on all four wheels. The Brush, it is true, did not have *independent* coil suspension on all four wheels, but it embodied an ingenious combination of radius rod and friction-type shock absorber, decades ahead of its time.

Alanson P. Brush, versatile auto designer, used a chassis frame and axles made of wood for his Runabout. The wood—hickory, maple or oak—was oil-treated and air-dried before painting. With metallurgy still in its infancy, Brush claimed that wood combined lightness with great strength and the resiliency of steel. He proved correct. Some 3000 Brush Runabouts were built and sold for \$500 before the public's fancy latched on to something else. The Brush, however, featured many ingenious details. For instance, the coil springs had the additional advantage of operating under tension and closing up on the rebound, instead of working under compression as they do today.

Brush also had some practical ideas about engine balance. The Runabout's single-cylinder, seven-hp engine could turn a smooth 2200 rpm—an exceptional speed for that time. This performance was possible not only because of the usual crankshaft counterweights, but by an extra loaded system of weights driven from the crankshaft and rotating in the *opposite direction*. This arrangement was claimed to "remove all vibration due to reciprocating weight and, in addition, most of the torque vibration."

Incidentally, the coil springs gave the Brush a much shorter turning radius than the average car of its day, and this, combined with a short wheelbase, made it very maneuverable.

● *Underslung chassis*. Many modern automobiles no longer have a separate chassis frame. The floor pan and body are welded in one piece, but the principle used for getting a lowered center of gravity (with superior roadability) goes back to 1907. The basic idea is to suspend the mass *below* the springs, and not perch it on top of them. Harry

C. Stutz, then with the American Motor Car Co., designed this idea into the famous Underslung, soon to be copied by other American makes such as Regal. By giving the front axle a steep upward curve at either end and using upswept frame members so that the front springs were carried high, both axles could be suspended at the same level.

"In swinging this frame," the car catalog read, "the center of gravity is lowered, throwing the weight near the ground. This system affords great safety in turning corners, for the reason that the springs are so nearly in line with the horizontal center of the mass of weight that, instead of being deflected vertically, the load is applied to the side of the springs. As the spring cannot be deflected laterally, the frame is retained in a horizontal position and the unpleasant swing-out feeling at a corner is quite obviated."

Other advantages claimed were "a straight-line drive for the propeller shaft and the conservation of engine energy ordinarily lost by an angle joint." Skidding was eliminated and the driver could see both front fenders, yet the American used "selected hickory" wheels of 12 spokes and 40-inch diameter. Tire size was 40 x 4-inch and small diameter, low-profile, extra-wide-tread tires had not even been thought of.

● *Interaxial seating*. Today, cradling the passengers between the front and rear wheels of a modern sedan is standard, but don't imagine for a moment it's a new idea. Many people regard this design as an "innovation of the '30s." In fact, it goes back to 1913. Then, the Austin Automobile Co. of Grand Rapids, Mich., (no connection with the British Austin) patented a system of

[\(Please turn to page 220\)](#)

## 1907 | BRUSH COIL SUSPENSION

BRUSH RUNABOUT, a popular two-seater, had coil springs all around way back before the Great War

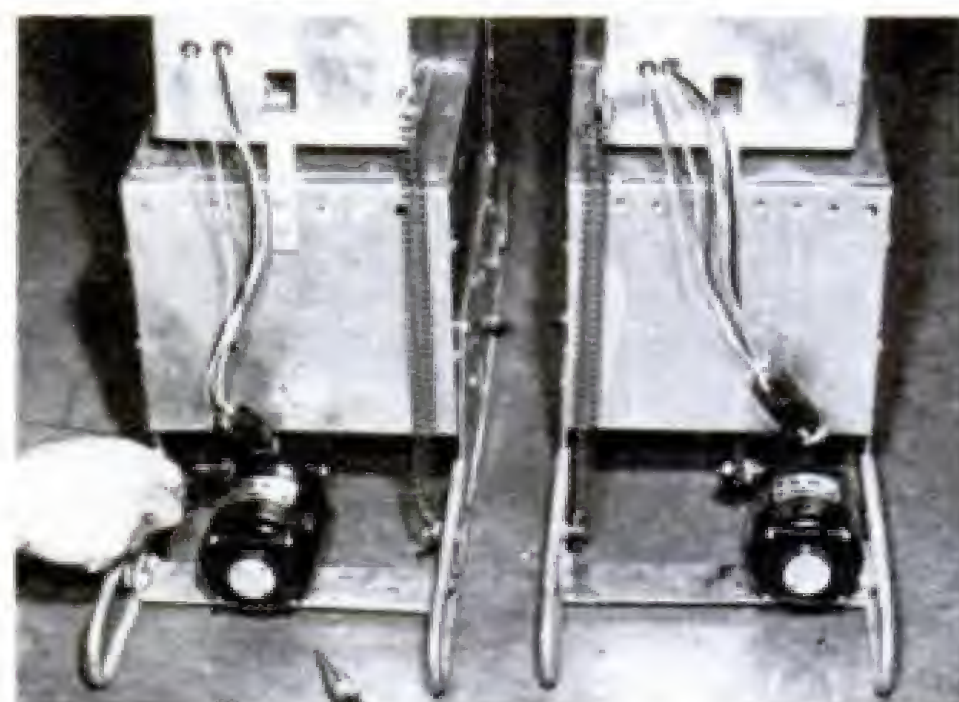
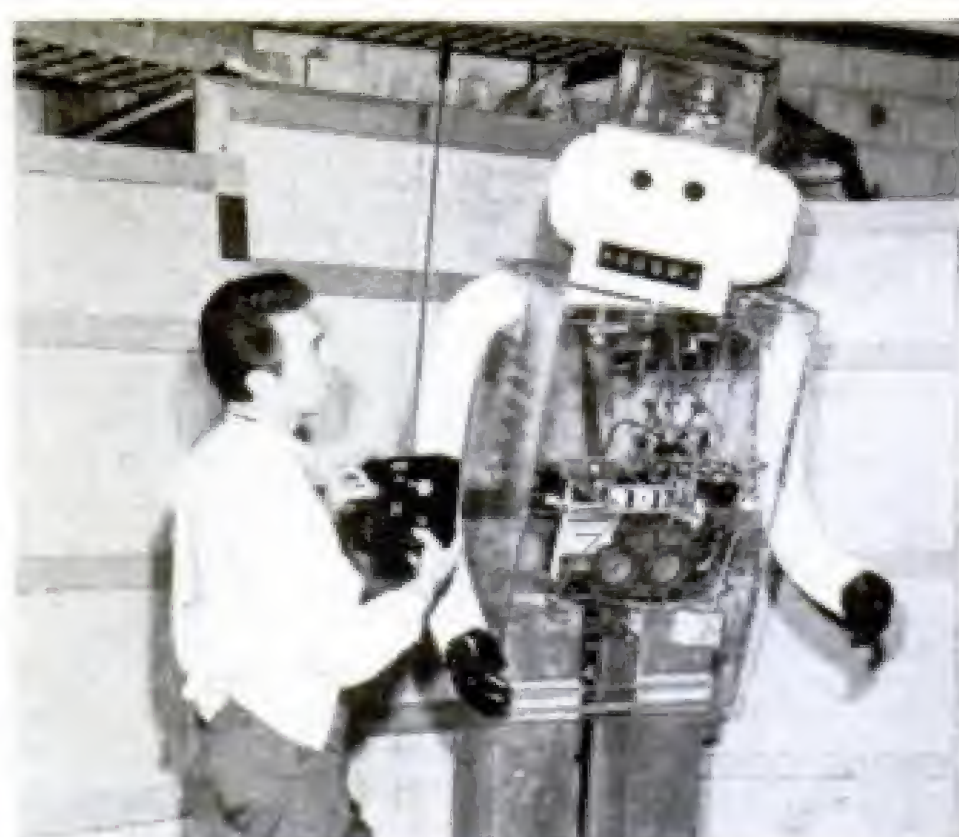
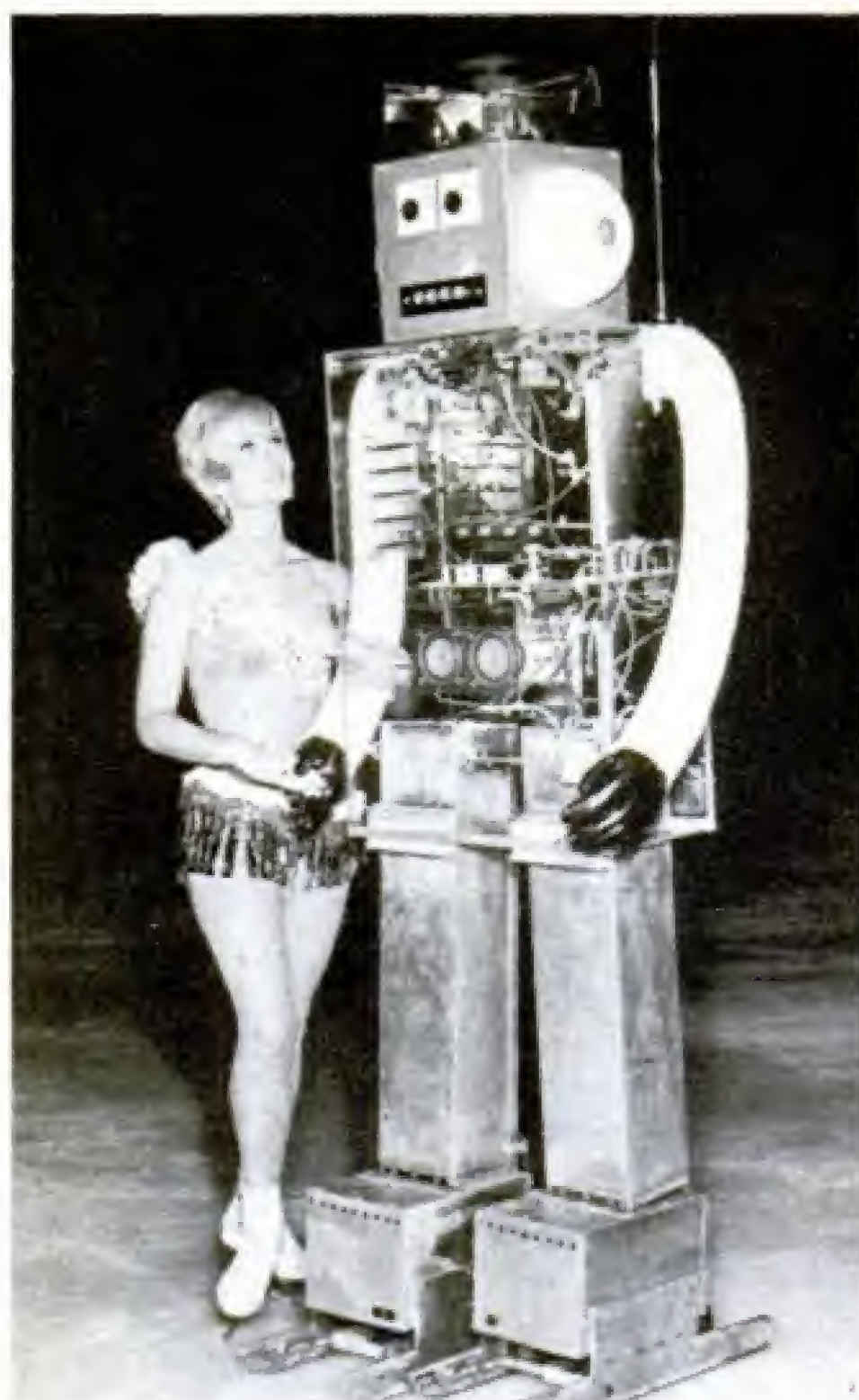
Color Photo by Tom Burnside

POPULAR MECHANICS









## First year of skating—and he's in the Follies!

Commander Robot is a 7-foot, 4-inch aluminum and plexiglass creation whose skating skill rates him a featured spot in Shipstads and Johnson Ice Follies of 1969—as well as an admiring glance from another skater (left) who obviously is not a robot. The robot's creator, Dave Colman (upper right), demonstrates the radio gear that transmits to the robot's 14-channel receiver to activate seven motors and control movement. In the robot are 50 pounds of batteries, clusters of servo switches, tape recorder, assorted lights and two 1/50th-hp motors (lower right) that drive sprockets that bite into the ice to make him move.



## Supersonic Blowpipe

Britain's new infantry weapon, the Blowpipe, is a supersonic missile that's fired from a hand-held canister against surface targets or aircraft within a four-mile range. The entire unit, including one round of ammunition, weighs 40 pounds. Incorporated into the firing canister is a sight and control that guides the missile to its target.





**APOLLO SPACECRAFT CREW** for first flight with lunar module (from left): Russell Schweikart, LM pilot; Lt. Col. David Scott, CSM pilot, and Lt. Col. James McDivitt, commander

**Hopefully, before the month is out, ungainly LEM will burst out of its shroud and unite with a free-maneuvering Apollo. On the success of this union hang our chances of planting men on the moon this year**

By WALLACE CLOUD



# The Moon Bug Learns to Mate

**O**UR FIRST TRUE SPACESHIP, Ray Pratt calls the Apollo Lunar Module. "It can't even be tested satisfactorily in the atmosphere. We won't be sure about it until the astronauts fly it into orbit."

Pratt, a mission-support expert at Grumman Aircraft Engineering Corp., was steering me through the complex LM construction and testing facilities. Climbing in and out of spacecraft in various stages of completion, we discussed what will happen during the first manned flight of the gawky-looking moon bug.

(Formerly called LEM, for lunar-excursion module, the vehicle is now officially called the LM, for lunar module. But in conversation among space engineers, the familiar LEM sticks.)

Even though Apollo 8 was more exciting, this mission, Apollo 9, is the key to actually *landing* on the moon.

At launch, the basic configuration

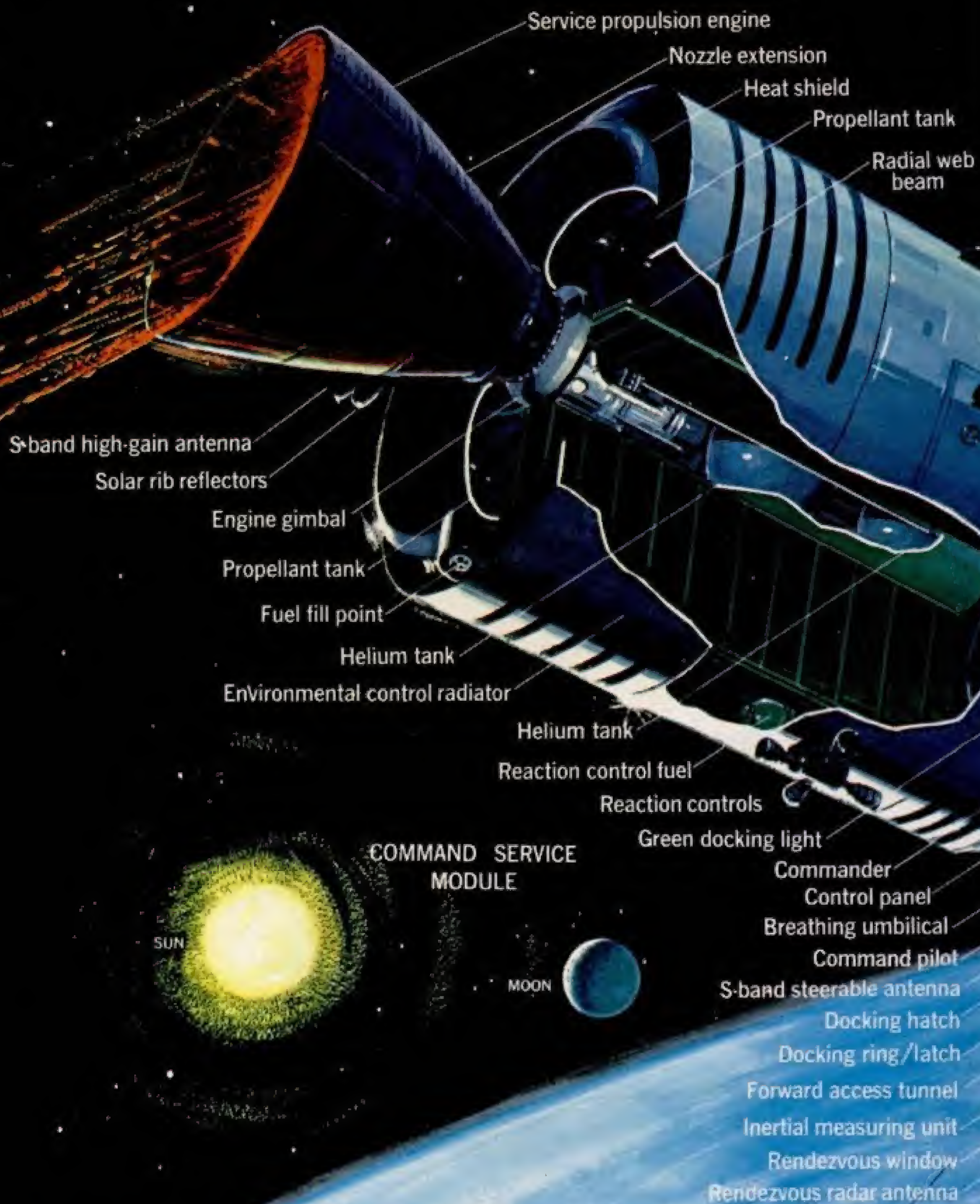
goes like this. The Saturn V rests on the launching pad. The LM is stowed in the third stage, with its legs folded and within a protective shroud. The Saturn is topped off by a service module and command module, both exposed and collectively known as the Command/Service Module (CSM). The astronauts take the initial ride into space in the command module, often identified as the Apollo, although it's more correct to refer to the entire configuration, including the LM and CSM as the Apollo Spacecraft.

In orbit, the three-man crew in the command module will detach the CSM, pitch over 180°, dock hatch-to-hatch with the LM, then detach the mated pair from the Saturn's third stage and pull away.

Only then—for the first time in the space age—will astronauts move from one spacecraft to another, crawling

*(Text continues on page 124)*





Command Service Module emerges from shroud using vernier rockets



CSM turns around to nose in toward Lunar Module



CSM mates with LEM



and both move away from third stage booster

With LEM attached, CSM uses main rocket

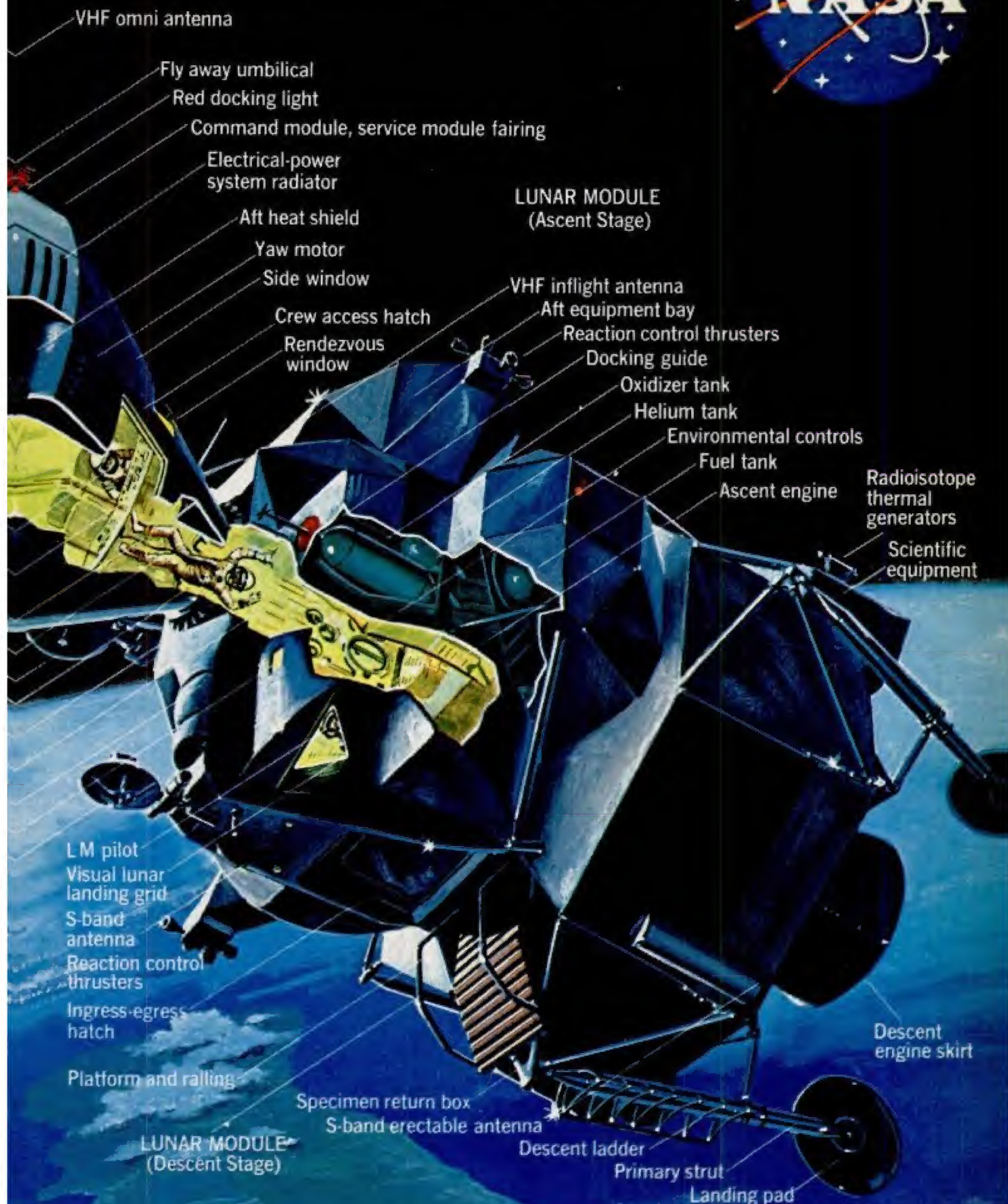


to move into proper orbit



# APOLLO SPACECRAFT

*Astronauts in first transfer from Command Module to Lunar Module in test flight while in Earth orbit.*



*Illustration created especially for Popular Mechanics by Fred Wort, Ed Valigursky and Marian Manfredi*





LM CABIN, behind astronauts, shows hatch (top) to CSM crawlway, ascent-stage engine housing (bottom)

from the CSM to the LM. Next they will rehearse, while in Earth orbit, what other astronauts must do in a later mission to land on the moon. They will detach the LM, simulate a moon landing and moon takeoff, rendezvous with the CSM, and return to Earth. How are they going to manage such an intricate series of operations?

To find out, I put on a surgical cap and gown and followed Pratt into the dust-free LM construction area, and got my first surprise. The LM is big, two stories tall (22 feet) and 16 tons heavy. I thought, "They're going to land *that* on the moon!"

The LM looks like a gargantuan bug, a scowling face with triangular eyes in a lumpy head that rests on a squat, octagonal body that is supported by four crouching legs. Actually, the "face" is a two-man cabin with windows.

The LM is a two-stage rocket ship. The octagonal base houses fuel and oxidizer tanks surrounding a rocket en-

gine; this is the "descent stage," which produces the thrust on which the LM will balance as it descends to the lunar surface. The legs contain crushable aluminum honeycomb material to cushion the landing impact. The descent stage will also serve as a disposable launching pad when the LM lifts off the moon. The upper section is a detachable "ascent stage," its cabin and equipment clustered around a rocket engine normally concealed from view.

The entire ship looks strange because it's designed to function only in space, and has been stripped of all nonessentials that would add weight and waste fuel. Because the LM is also designed as a disposable craft, to be jettisoned in space, with a life span of only 48 hours once its systems are turned on, a lot of checkout must be crammed into the few earth-orbiting test flights that will take place before the actual lunar trip.

On the first orbital flight, the scheduled crew will consist of Air Force Lt. Col. James McDivitt, commander; Russell L. (Rusty) Schweikart, a civilian, LM pilot; and Air Force Lt. Col. David Scott, CSM pilot.

Their first job, once in orbit, is to "extract" the LM from the housing called the spacecraft-LM adapter, or SLA (pronounced "slaw"), behind the CSM at the tip of the Saturn booster.

Firing a shaped explosive charge will cut loose the joined modules and release the "petals" of the SLA shroud, pulled open by a spring-cable system.

Next comes a maneuver called transposition and docking. The CSM pilot fires the small rocket jets of the reaction-control system to move the CSM 50 to 100 feet away from the LM. Using the same jets, he brakes, flips the ship end-for-end, and moves back in to dock. This is done by means of "probe and drogue" gear. A probe projecting from the command module's docking tunnel is poked into a funnel-shaped drogue in the LM's hatchway. Hooks on the probe engage the drogue. Then a gas-powered piston in the probe is retracted, firmly pulling the two craft



together, and latches are then fastened.

During close docking maneuvers, the pilots control their spacecraft manually, and line up the target visually. Other maneuvers will be controlled through computers, but the delicate management required for docking can be entrusted only to human judgment.

Now the command module's hatch is opened and a crew member reaches into the docking tunnel to plug in a short umbilical cable. This enables the CSM pilot to fire explosive bolts that hold the LM to the third stage of the booster. The docked spaceships will then be free in space.

The LM crew, McDivitt and Schweikart, will enter their lunar ship on the third day of the flight. When it's time, the LM pilot reaches into the hatch tunnel and demounts the probe and drogue, which are stowed in the command module. Then both men crawl through the tunnel into the LM cabin. There are no seats, so the astronauts "stand" weightless—buckled into restraining harnesses before the triangular viewports and instrument panels.

During various tests, the LM will be

activated and deactivated several times. By turning on and off the life-support system and other systems that consume power, the LM can be left dormant for long periods, stretching its 48-hour life.

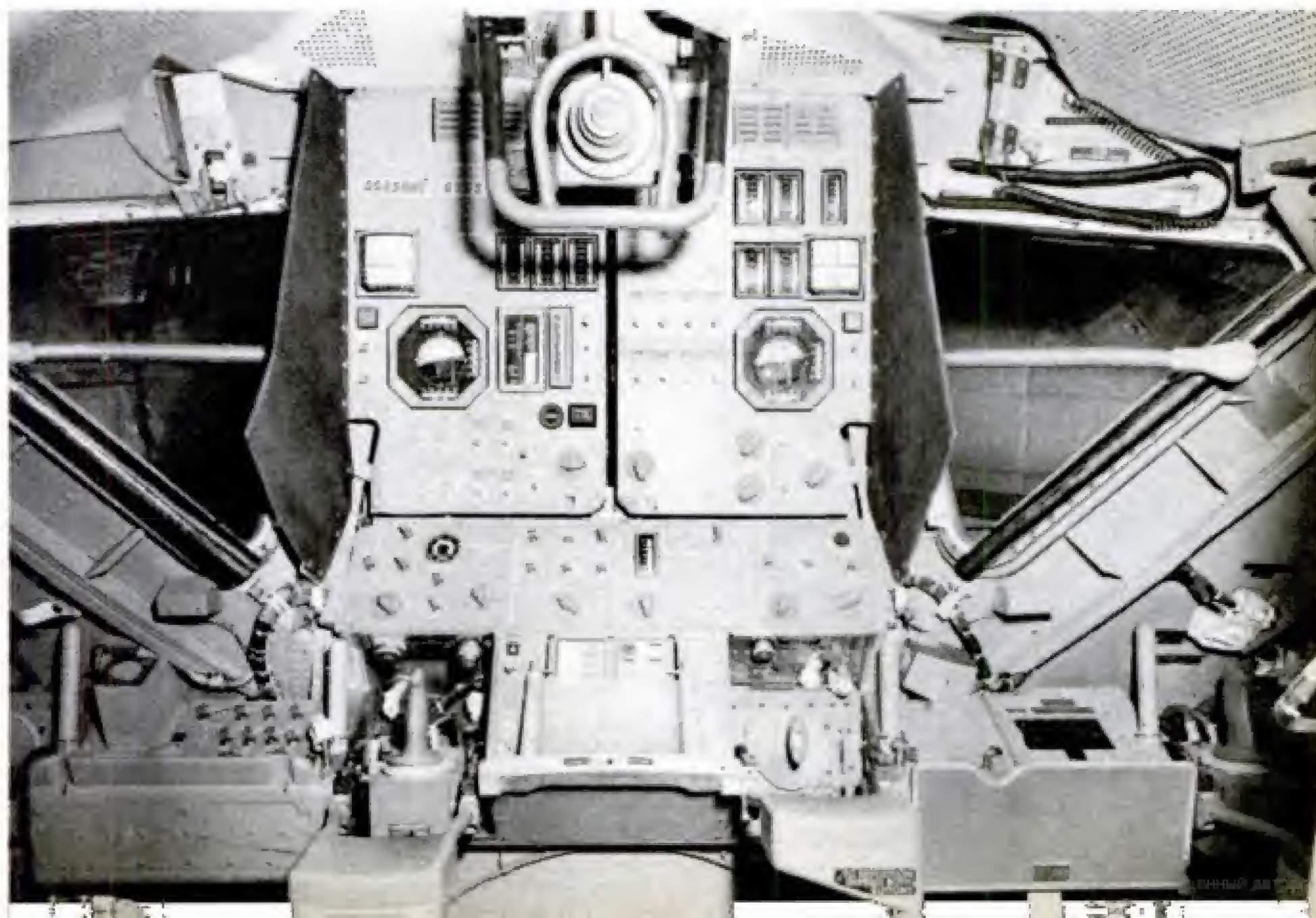
The fifth day should provide the most spectacular space acrobatics—separation of the LM from the CSM, maneuvering up to 90 miles from the mother ship and in another orbit, then simulating a climb from the moon to the CSM.

To begin, McDivitt and Schweikart will enter the LM, activate its systems and check them out. Then they will re-install the probe and drogue in the tunnel and seal the tunnel's end hatches. Scott, who stays in the command module, throws switches retracting the probe hooks and tunnel latches. The LM pilot, Schweikart, fires his reaction-control jets to move the LM.

Now, for a first time, men will fly the lunar module. After a runthrough of the attitude-control and station-keeping systems, they fire the descent engine to brake the spacecraft, simulating descent to the moon. The LM falls toward

*(Please turn to page 222)*

**LM INSTRUMENT PANEL.** One astronaut will stand at each window, strapped in, during free-flight maneuvers. Below panel in center is front hatch where astronauts will emerge for ultimate landing on moon





# LAKE

## *A Spectacular Test Ground*

**PM reports on how you can use this 21-foot bow-rider as a camp trailer on land — as a camp boat afloat**

By DAN FALES, Boating and Outdoors Editor

Photos by Joe Munroe

**W**ILDERNESS BUFFS AND RIVER RUNNERS liked Glen Canyon better the way it used to be—when the savage Colorado meandered quietly through its awesome, but surprisingly placid, gorge. Now there's no river, but a lake—a big one—and perhaps the most scenic and spectacular water in the world for ordinary powerboats.

The boat I am testing between Lake Powell's red-walled cliffs and amphitheaters is no ordinary powerboat, but a luxury stern drive with a 160-hp engine. Instead of drifting, I move along at 35 mph.

Canyon after canyon along the shore calls for exploration. I stop at some and listen for the echoes of history: mules struggling





# ***POWELL:*** ***for Glastron's Vagabond***







**A GREAT FEATURE** on Vagabond is the stern steps. Not only is it easy to climb aboard from the water, but it's easy to climb aboard from dry land when the boat is high on a trailer. The steps fold into the stern neatly (see photo at bottom of the page)



**SNORKELING** or scuba diving are only two of the many boat-fun activities made easy by Vagabond's design. Ranger Lynn Pattan has been trained for underwater work. This is part of his exciting job. On a trailer, Vagabond (right), can easily be made into a camping rig by setting up the "tent" as shown on the next page. Rigging the tent is a simple matter once you get the hang of it



to hold Mormon wagons back as they descend through Hole in the Rocks; lingering echoes of those who camped at Cathedral in the Desert; Teddy Roosevelt astride a horse gazing at Rainbow Bridge—sights that men spent days reaching, risking life and limb. They were worn and tired and angry and hurt and awed. I'm comfortable and fully equipped.

All this you can do, too. You can see it, feel it, hear it, live it. I am testing a camping boat; you can come in your own boat.

Eight years ago, men built a barrier across the Colorado River. They called it Glen Canyon Dam. It's enormous. And it's the cork in a 183-mile bottle that's shaped like a lightning bolt. It's Lake Powell starting at Page, Ariz., and spearing deep into Southeastern Utah. The lake is named for Maj. John W. Powell, who was the first to explore this glenlike section of the Colorado just 100 years ago.

Right now, I'm 400 feet above the level that Powell rode 100 years ago. The water behind the dam is that deep. I'm in a 21-foot Glastron boat called the Vagabond because it's a camper, too. With me is Joe Munroe, an experienced river runner and expert photographer, and Lynn Pattan—a young, energetic ranger for the National Park Service.

Our purpose—see Lake Powell and try out the camper boat.

At 9:05 a.m., the three of us leave our base at Wahweap, Ariz. This is Park Service headquarters for the Glen Canyon National Recreation Area



which includes Lake Powell. It's also one of four major boat-launching sites on the lake. Gas, food, fishing licenses and boat supplies are available here.

A cold wind, threatening sky and a light rain force me to raise the navy top on the Vagabond. This is an easy task, taking not more than two minutes. With the top up and the window/door to the bow-riding section closed, I am out of the elements. But there's no windshield wiper on the Vagabond so during rain showers, I find my eyes straining to see Lynn's boat ahead.

We are taking two boats along—the Glastron and a high-powered craft used by the Park Service to patrol the lake. By the way, the Park Service does a tremendous job of keeping track of people on the lake. They use boats with big "RANGER" signs on the sides. You can spot them a mile away. The Service also marks the main channels and anchors information signs at entrances to the most important and scenic side canyons.

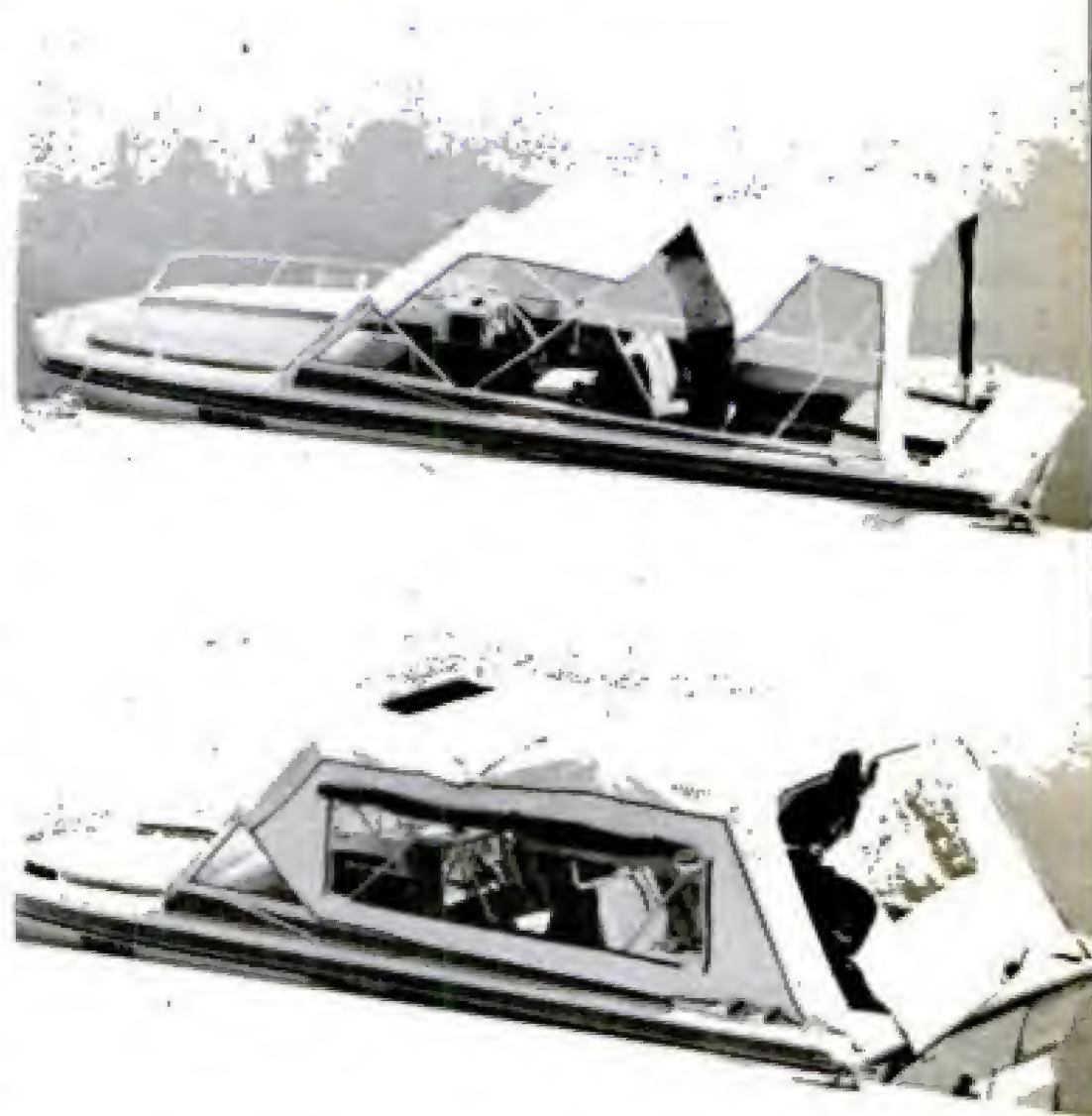
But my first meeting with Lake Powell is not in a side canyon but right out in the main channel. We are not 15 minutes from Wahweap when we enter the Narrows. This is a 10-mile section that's only 200 yards wide.

Boat wakes are the big problem in the Narrows. There's no place for the

energy developed in the wakes to dissipate. A wake will bounce back and forth across the channel for 20 minutes. You couple this one wake with hundreds and you can see the situation—especially bad on weekends when there's heavy boat traffic.

This is the first chance to test the Vagabond. At three-quarter throttle, I hop these ricocheting wakes. Vagabond with its cathedral hull is stable, dry, easy to handle. When she comes off a wake top and hits "bottom" her weight

*(Please turn to page 224)*

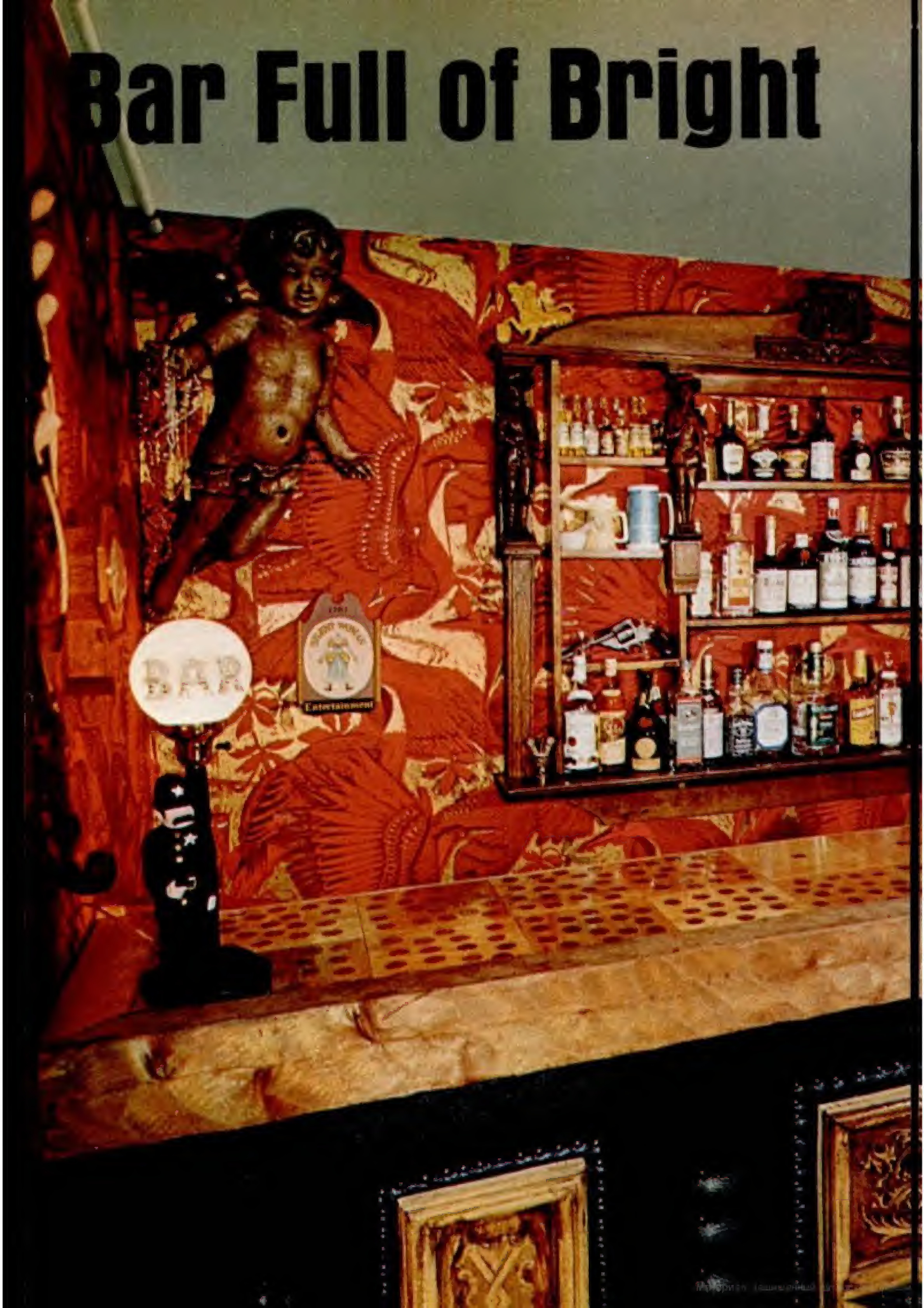


**ERECTING THE TENT** (upper right) means zipping together navy top and stern top, adding the two side curtains, zipping on the stern curtain. All curtains snap down on hull. With tent up (right) there's plenty of room inside. (The Vagabond has a storage area amidships between the two lounge seats.) Up under deck are two bunks (bottom) which sleep two six-foot people. Cushion between bunks covers head



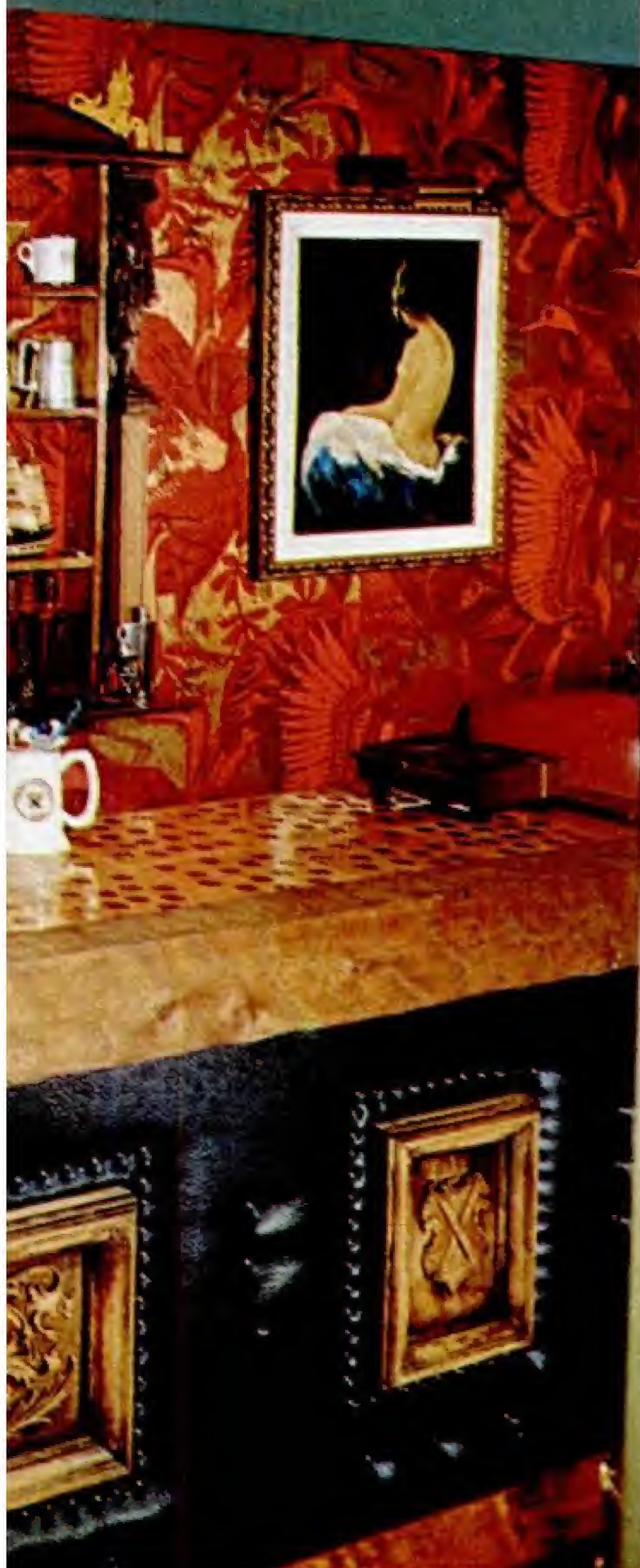


# Bar Full of Bright





# Ideas



**YOU CAN ALMOST SEE** Diamond Jim Brady hoisting a few at this nostalgic "Silver Dollar Bar." Yet the coins embedded in the bartop are not silver, but shiny British pennies fitted into holes drilled in parquet flooring blocks.

The figures on the liquor shelves look like expensive custom carvings, but they came off the legs of an old dining table.

Paul Bruckman, a General Electric sales executive, ordered the pennies through his bank and covered them with marine varnish. (Clear casting resin would provide a more durable surface.) He salvaged the table legs from the basement of a house his family was renting before moving into their new home in Stamford, Conn. Carved panels on the bar front came from an old chest; carving at the top of the shelves from an old headboard.

What all this proves is that ingenuity is more important than money, and that you can do a lot with a little imagination.

The Bruckmans admit they splurged a little on the handsome red wallpaper in this tiny space off their family room. The 25-in.-high baroque cherub is a plastic reproduction that costs about \$16 from Artistic Latex Form Co., 1216 Brook Ave., Bronx, N.Y. 10456.

If you'd like to try the casting resin for your next bar project, you can order it from Polk's, 314 Fifth Ave., New York, N. Y. 10001. A gallon, with catalyst, costs \$8.50, postpaid. ★★★



Photos by Robert Borst



# BUILD THIS Colonial Cabinet-Top Desk

By PATRICK K. SNOOK



**L**ARGE COLONIAL DESKS have become as rare as the wide pine boards used to build them. However, a little digging around at local lumberyards will usually turn up the necessary wide clear-pine planks. Once you have the material, making the desk is easy.

Lay out and cut the two sides from  $\frac{3}{4}$  x 22 x 122-in. planks. Cut the center divider, five shelves, bottom for the top cabinet, writing table and lower cabinet shelf.

Cut the  $\frac{1}{4}$ -in.-deep rabbets for the shelves, writing table and bottom of the top cabinet. Remember that the bottom shelf runs only from the right side to the center divider.

Glue and nail the shelves to the center divider, then fit the assembly to one of the sides. Nail it in place from the outside and use plenty of glue. If you want an authentic look, you first can flatten the heads of the nails to give them the appearance of old hand-wrought nails.

Assemble the drawer support and nail it to the bottom of the upper cabinet base. Now fit the entire assembly to the desk side, glue and nail it in place, then assemble the remaining desk side.

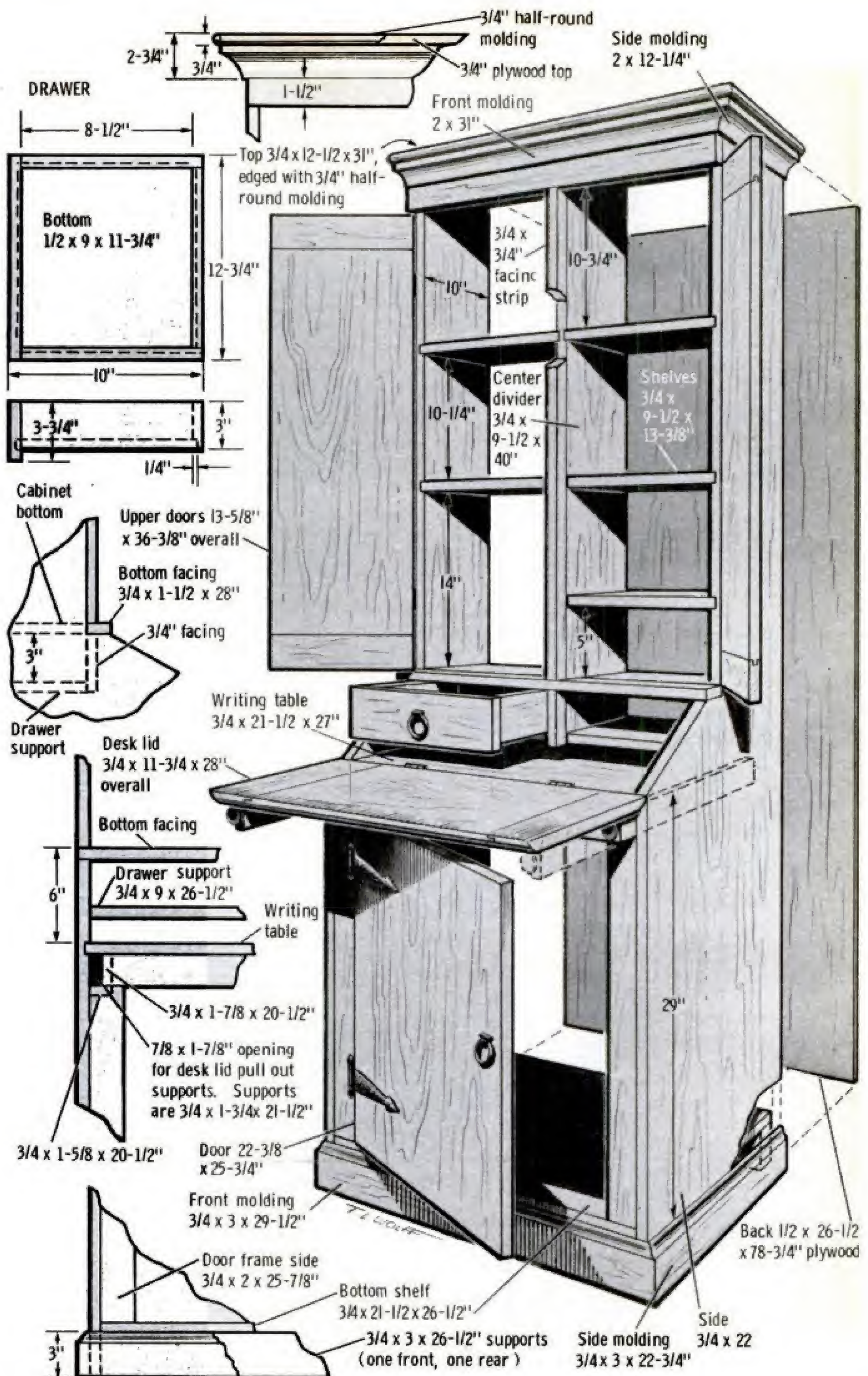
Fit the upper front crosspiece and center divider front strip, then assemble the

lid support housings and clamp in place before gluing to be sure that the lid supports have enough clearance to slide freely. If the fit is correct, glue and clamp the housings in place, making sure that you leave enough clearance so the door-frame pieces will fit flush with the sides. Allow sufficient time for the glue to set, then frame in the lower cabinet door. The top door-frame strip is nailed, from the front, into the ends of the lid support housings. The rest of the framing is glued and nailed, from the outside, to the sides.

Cut the desk lid and upper cabinet doors and fit the end pieces by tongue and grooving. These three pieces are hung with a pair of 2-in. wrought-iron "H" hinges. In order to achieve a good flush fit on the desk lid, it may be necessary to chisel the sections under the hinge pins. Then round the lateral edges of the lid.

Several coats of Minwax Early American oil stain, mixed with a bit of dark oak stain and black paint, will give the rich, warm tobacco color of aged pine. Sand lightly and finish with three or four coats of well-thinned shellac or Waterlox, followed by a thick coat of paste wax. When the finishing is completed, the back panel can be fitted in place. ★★★







# *Model This*





# 24-Pounder

1/20th actual size of a gun from the main battery of the U.S. frigate *Constitution*, this gleaming replica makes an attractive ornament for desk or bookshelf.

By WALTER E. BURTON

**I**F YOU ARE a dyed-in-the-wool model-maker, you know that plastic models can't begin to give you the satisfaction and pride of accomplishment you get from building an authentic replica from scratch. You'll get such a charge from modeling and displaying this 24-pounder from the main battery of the U. S. frigate *Constitution*.

While both English and American types of 24-pounders were in *Old Ironside's* complement of guns, this model, in gleaming brass and contrasting walnut, is patterned after the 12 American-type guns which were deployed at the forward and after ports. It's based on original shipyard plans which were followed in the 1927-1931 restoration of the *Constitution*. The vessel is still a commissioned ship in the United States Navy.

The original guns measured 9 ft., 5¾ in. in length and were of gray cast iron. The wooden carriages were of white oak, and most of the fittings were steel. The barrel of our model is brass and is approximately 5½ in. long, which makes it about 1/20th actual size.

Carriages for the guns in the main battery varied in size according to the gun deck, and the heights of the carriage bed blocks, which were used for elevating the barrel, were determined by trial during firing missions.

All the metal parts of the model are brass; the wooden parts are walnut. Clear lacquer is used to keep the

polished brass from tarnishing; the walnut carriage is finished natural.

Most of the dimensions are given in decimals. This is particularly true in the case of the gun barrel since the tool feed of a lathe on which it is turned is measured in thousandths of an inch. If you prefer to work in fractions, you can convert the measurements with the aid of a decimal-equivalent table. To increase the scale and size of the model, merely multiply each dimension by a suitable factor—such as 1.5 for a gun 8¼ in. long.

## The gun barrel

The gun-barrel blank is a 1-in. brass rod about 7 in. long. This length was selected as a convenient size for the Unimat lathe which I used in making the complete pilot model. Because a 3-jaw chuck would cut down on the usable length, the rod was center-drilled and mounted between centers, and driven by a dog made from the outer ring of



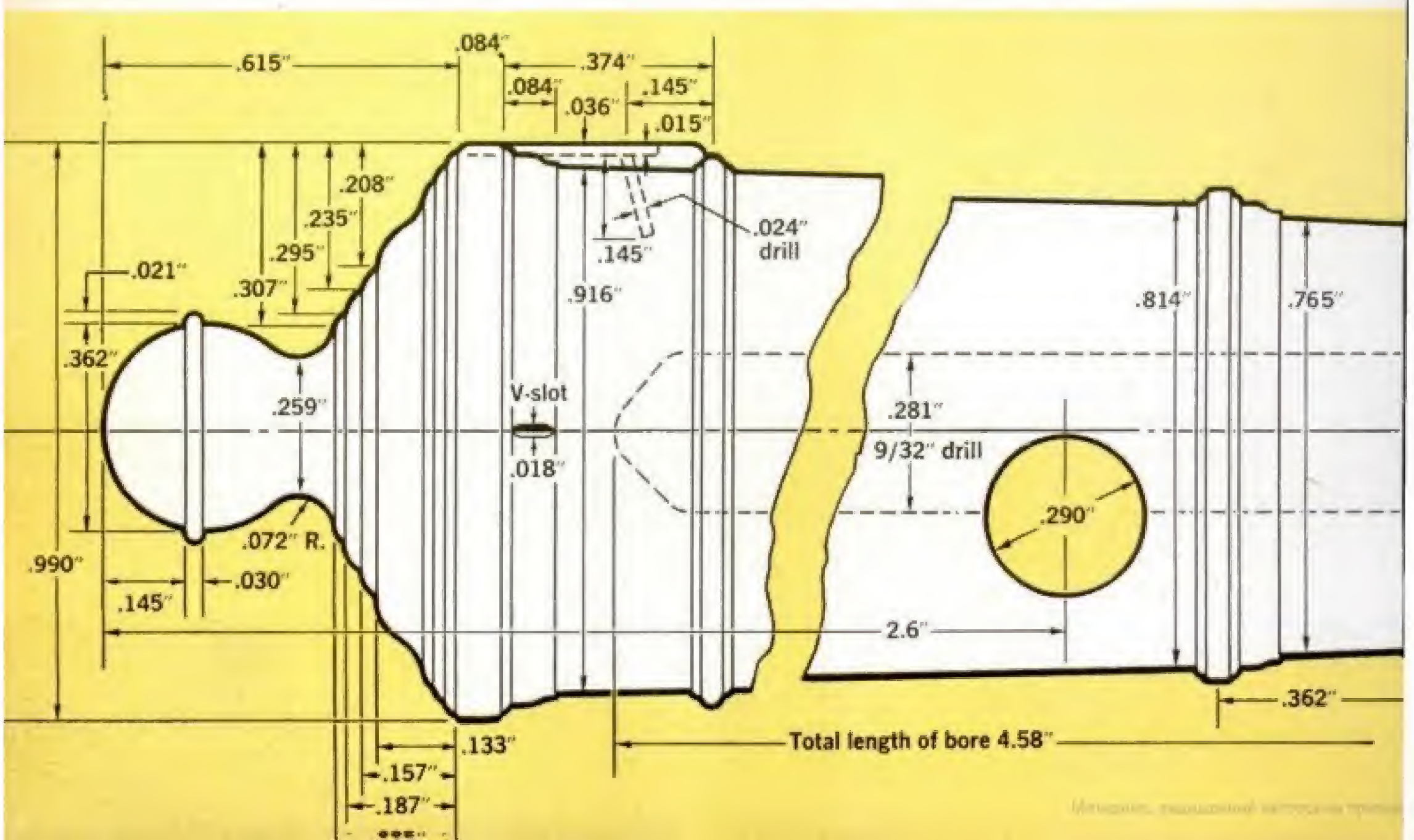
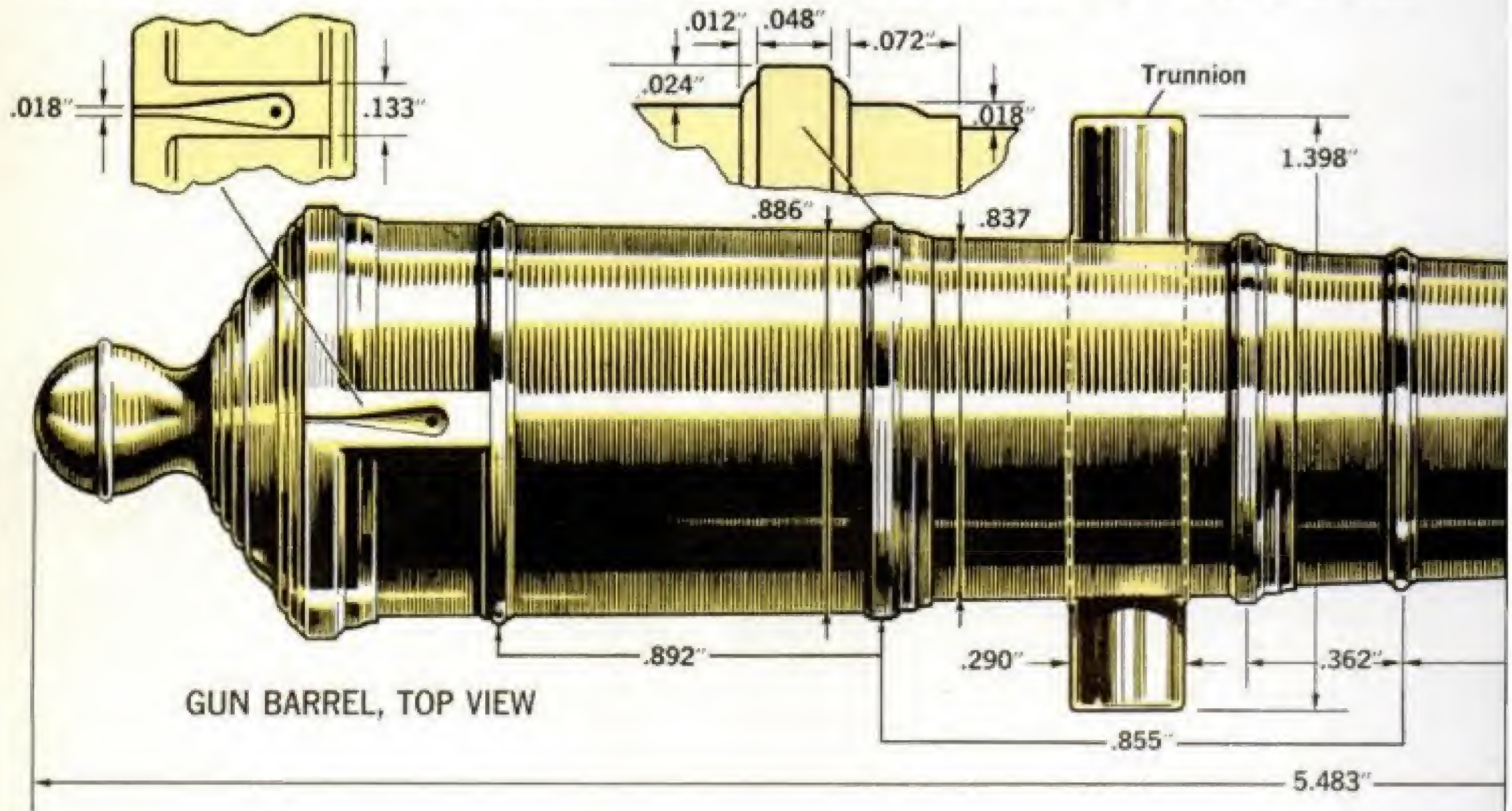




**BARREL BLANK**, mounted between centers, is driven by special faceplate dog made from ball-bearing ring



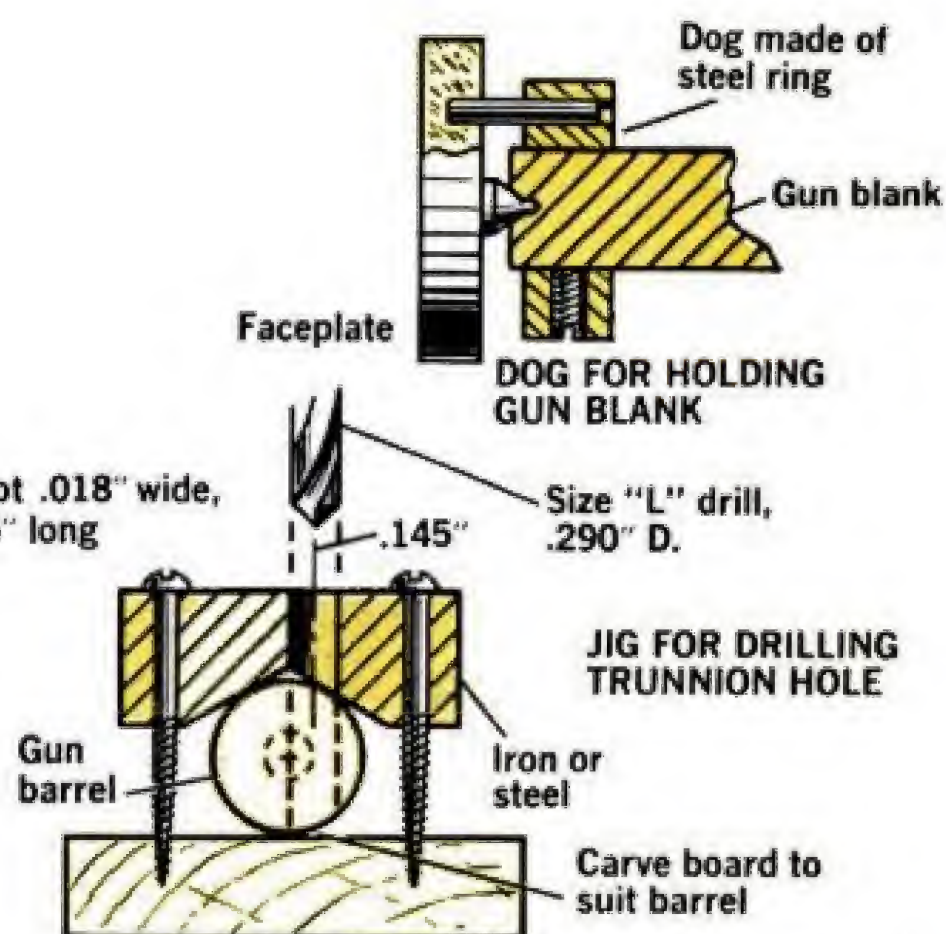
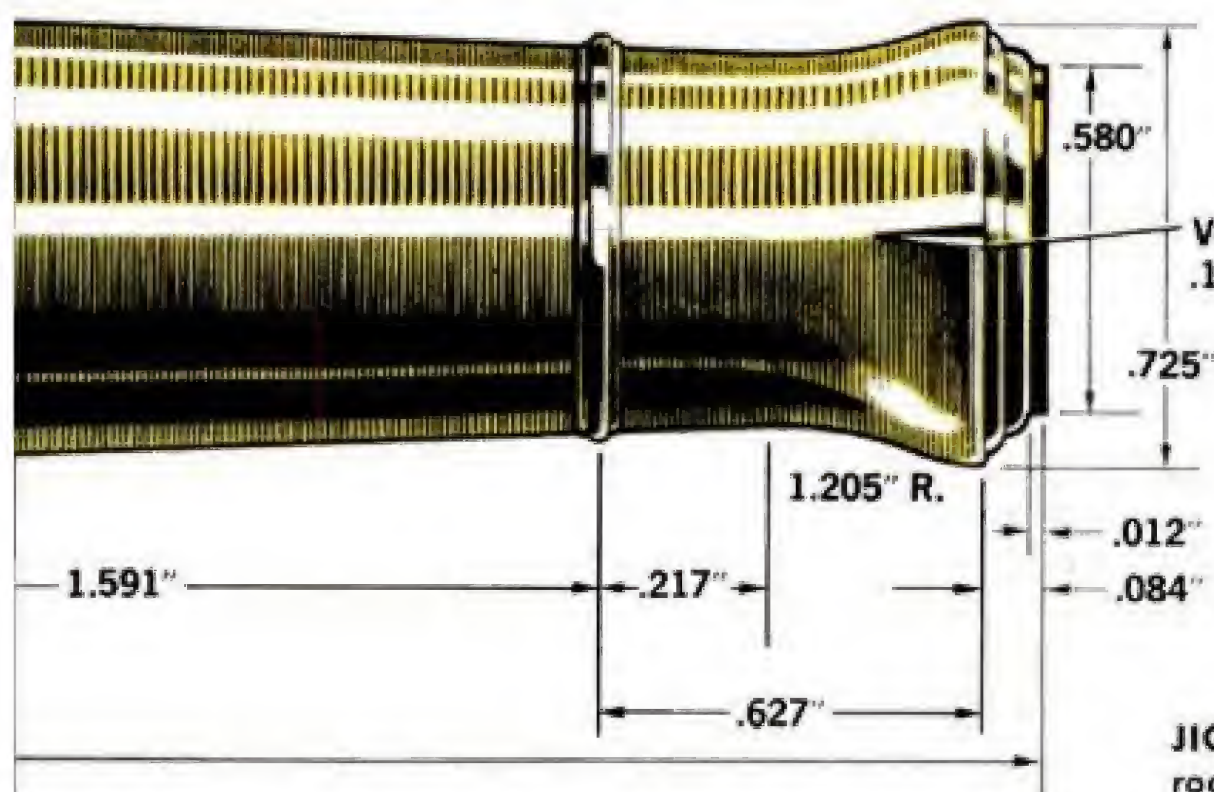
**AFTER RIDGES** are machined square they're rounded with Swiss-type file as done here at gun's muzzle end







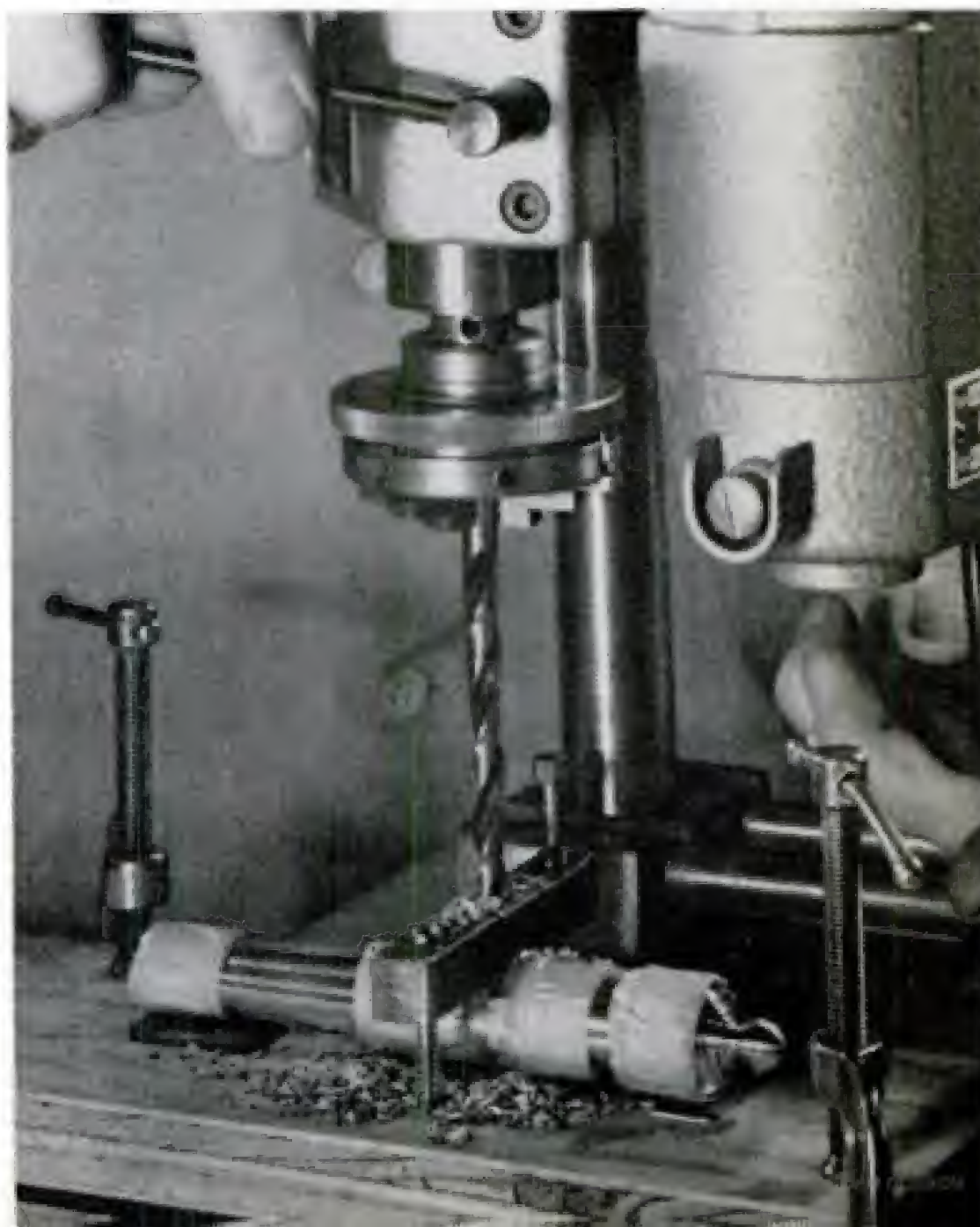
**COMPLETED BARREL** is polished in the lathe with a brass polish; the ball end is hand-finished later



**JIG IS USED** to drill hole through barrel for trunnion rod. Note how barrel is protected with masking tape

Trunnions are usually an integral part of a real cannon. In the model barrel, however, they are cut from brass rod. To drill the hole in the barrel for this rod, use the jig detailed above, right. If you lack an L-size drill (.290-in. dia.), you can make a  $\frac{9}{32}$  or  $\frac{19}{64}$ -in. hole and match the trunnion notches in the carriage. The rod forming the trunnions can be a drive fit or held with a setscrew on the under-side of the barrel.

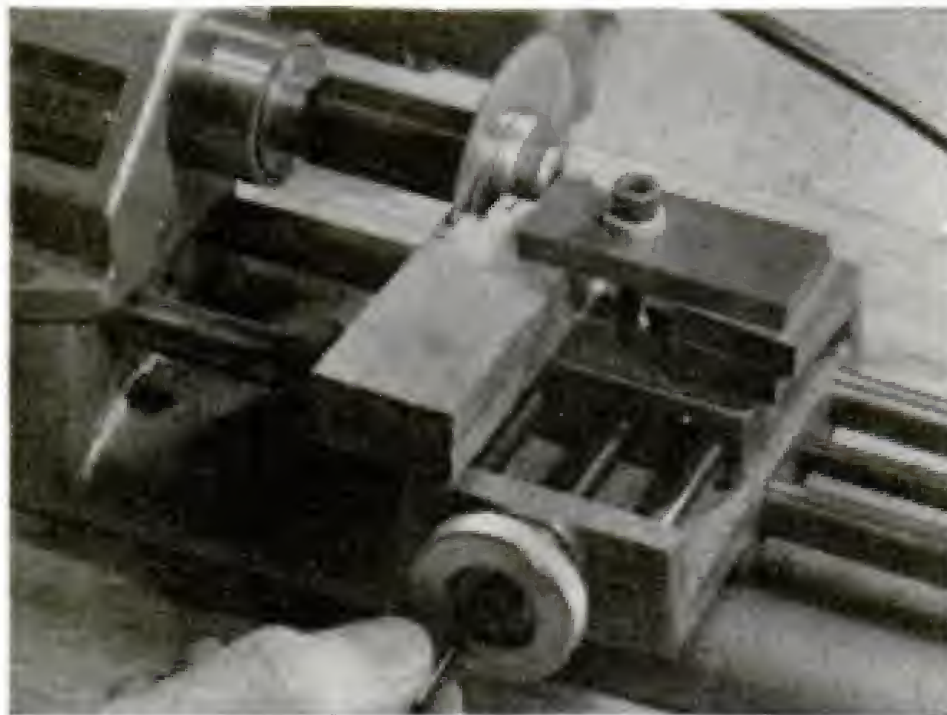
To bore out the barrel, use a  $\frac{9}{32}$ -in.







**THIN MILLING CUTTER**, on head spindle arbor, is used to cut walnut side members of gun carriage



**CUTS AT RIGHT ANGLE** to first ones are made in both side pieces at same time, require hand finishing



**CARRIAGE TRUCKS** are turned to final diameter by mounting discs on arbor of  $\frac{5}{16}$ -in. bolt and two nuts

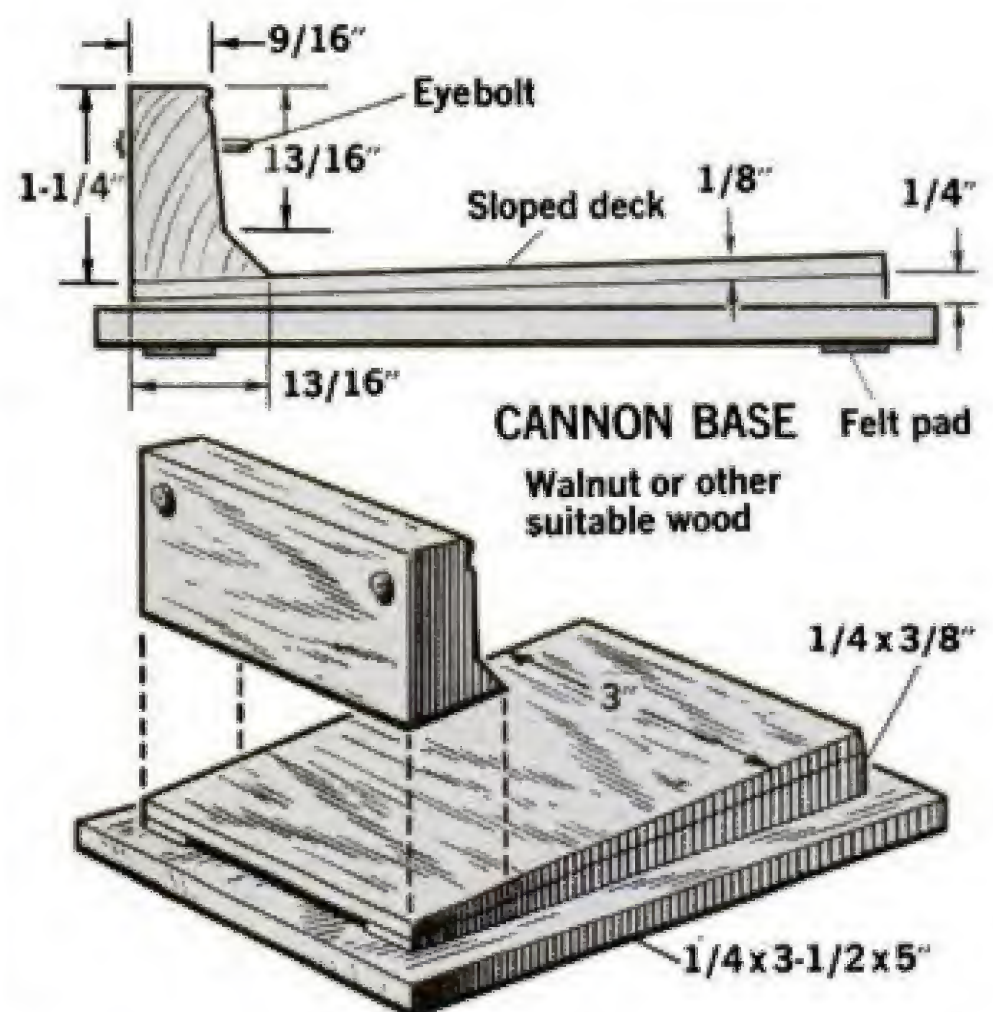
**HOMEMADE "PLUG CUTTER"** from  $\frac{1}{8}$ -in. pipe is used in drill press to round ends of wooden axle-tree parts



twist drill, starting at the center hole in the muzzle end. The drawing shows the bore full length, as in the original cannon, but in the model it need extend only to the trunnion hole, enough to keep the barrel from being muzzle-heavy.

The powder-igniting arrangement on top of the breech is formed as shown. The teardrop recess is a separate piece of brass soldered or cemented with epoxy to the barrel. V-shaped sighting notches on top and each side of the barrel can be hand-filed or scribed while the barrel is in the lathe. To do this, move the lathe carriage back and forth and feed a pointed tool so it shaves a notch .018-in. wide.

Before removing the barrel, polish it with very fine abrasive cloth. Then use a brass polish for a final luster. After cutting scrap from the breech, carefully smooth and polish the rounded end. If



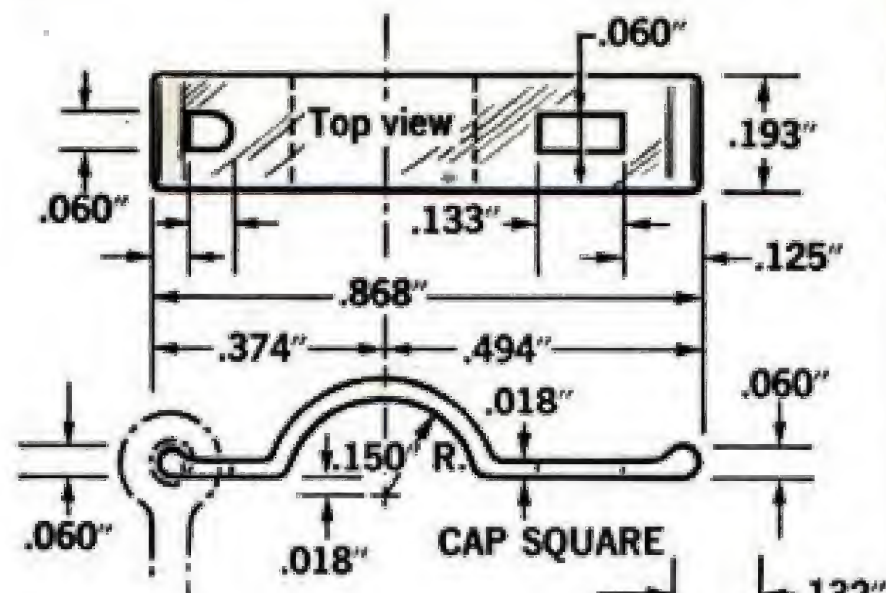
you solder the powder "pan" to the barrel, repolish the metal to remove heat discoloration. Spray the polished brass with clear lacquer.

### The gun carriage

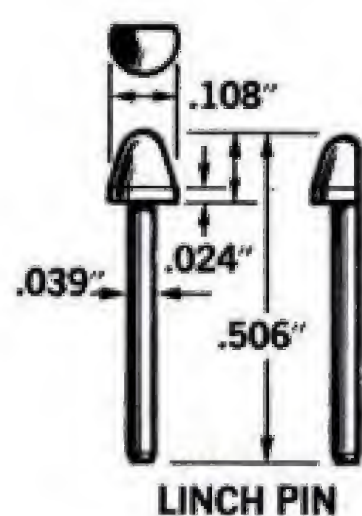
Full-size patterns for wooden parts on the gun carriage are shown at the right. As for the sides, made in pairs, you'll find it helpful to make a master pattern from aluminum or cardboard, then drill the ring and tie-bolt holes in it. Saw both sides at one time, tape the template to them, then drill the holes slightly smaller than the eyebolts. Note that the sides

*(Please turn to page 204)*

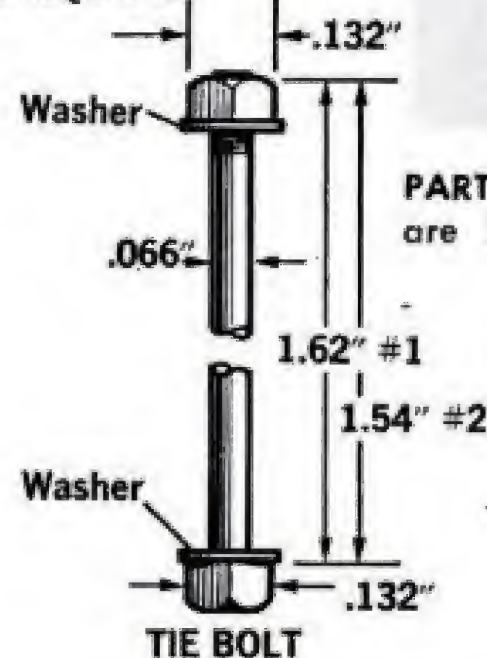




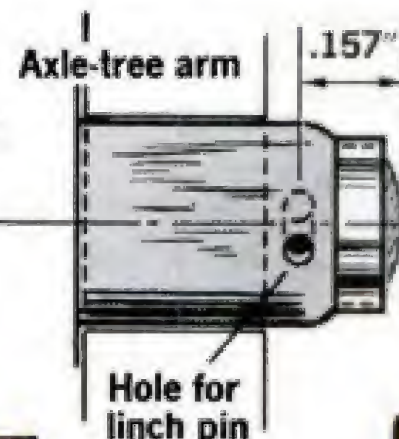
**PARTLY ASSEMBLED CARRIAGE.** Eyebolts and other parts are half-length to simulate bolts passing clear through



LINC PIN

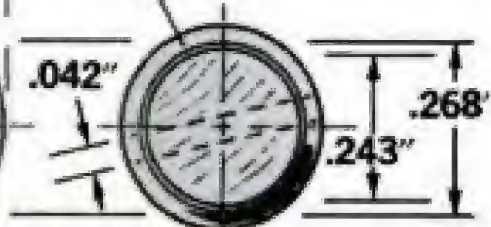


TIE BOLT

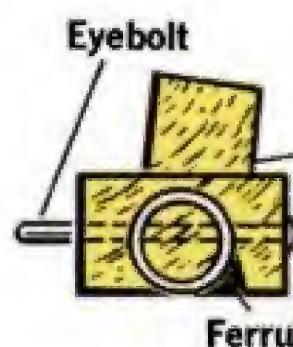


Hole for linc pin

Brass ferrule



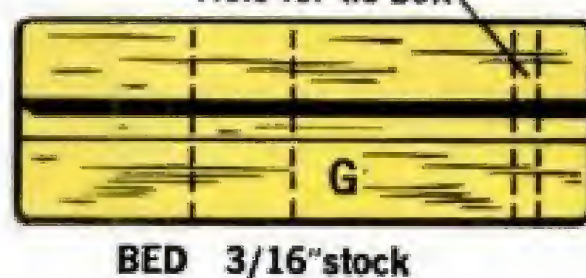
Hole for tie bolt



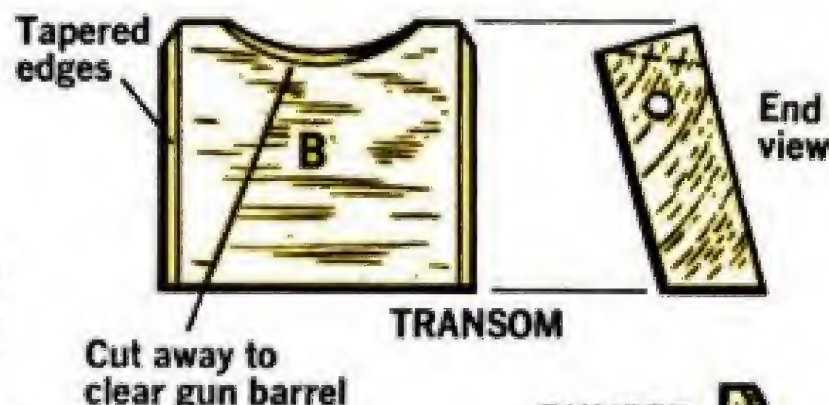
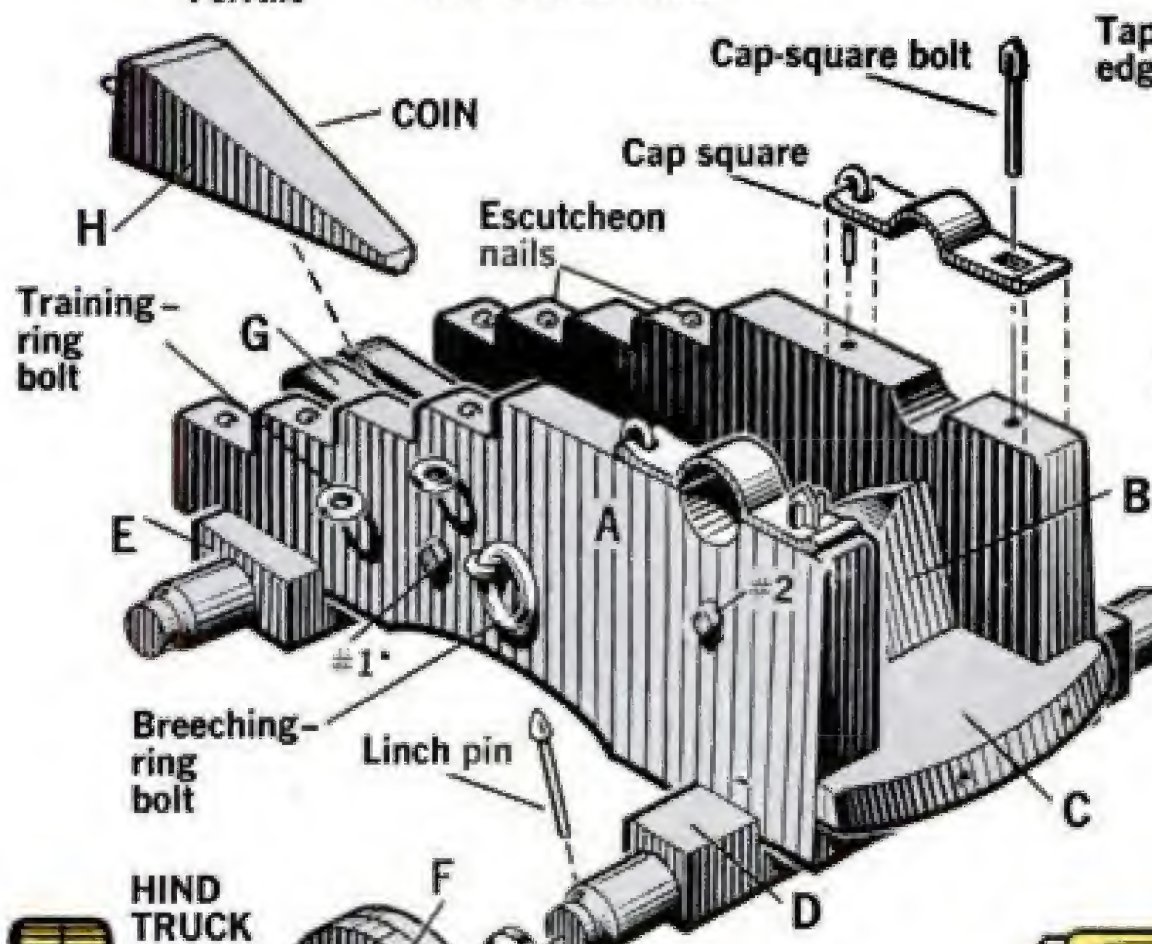
Ferrule



HIND AXLE TREE



BED 3/16" stock



Cut away to clear gun barrel

TRANSOM



BUMPER

GUN CARRIAGE

**NOTE TO READERS**  
All parts in color shown actual size for tracing direct from magazine

FORE AXLE TREE



5/16" stock



HIND TRUCK

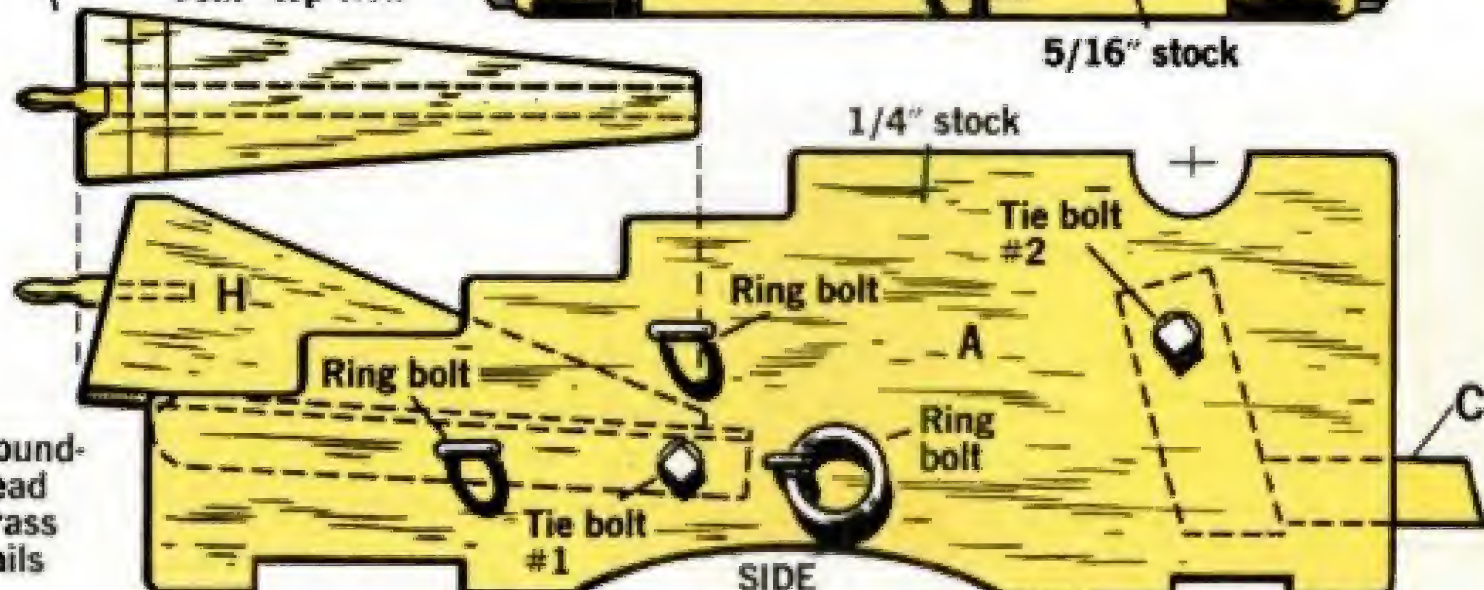


Coin top view

FORE TRUCK



Round-head brass nails



SIDE



# A Beauty Outside; Some Bugs Inside



By **BILL HARTFORD**, Associate Auto Editor

*Photos by Irving Dolin*

**I**T'S BEEN A LONG WAIT for AMX owners: "I drove a VW for eight years waiting for a car like this; three cheers for American Motors for the AMX," exclaims an Indiana dentist. And "it's about time," says a North Carolina accountant, "that American manufacturers gave us a choice in cars so we all don't have to ride around in Detroit bathtubs."

►He said it, I didn't.

AMX owners aren't subtle about giving it to the insolent chariots right between their quadruple, chrome-encased eyeballs. While America's biggest industry evolved and perfected the art of producing a superhighway, cruise-command capsule, some citizens awakened to the fact that piloting a "bathtub" may not be the ultimate driving experience.

Enthusiasts have been waiting—for the AMX: "We looked at foreign cars as the only comparison to the AMX. We bought the AMX even though I owned a Porsche," states an Illinois bank officer. A steamfitter from the same state "wanted a sports car—American made." He would probably

agree with a Massachusetts advertising man: "It's got the appeal of a Ferrari or Lamborghini!" "Just sitting on the street it looks like it's doing 100 mph . . . handles like a European job," brags a Texas aircraft mechanic.

A young computer clerk in Ohio and her husband share four cars: a Fiat, Volvo and Renault—and the AMX (no explanation for the collection). She likes the "continental lines" of their only American car. A computer analyst in Florida says, "I wanted a unique two-seater sports car with guts—I got it." And a building contractor from Florida articulates what many owners referred to: the fact that AMX's only domestic competitor is the Corvette. But "the AMX," as he says, "has the size, comfort, far better storage and, last but not least, price."

Indeed, the waiting is over for AMX owners. They are almost unanimous in saying that they've finally got the car that is their idea of what a car should be. "Hug-the-road handling," top praise of a Georgia-based, Army helicopter pilot,



**INTERIOR BUGS** cited by AMX owners include several elements of both design and workmanship. Ventless side windows, certain to be on cars from now on, as a glance at any futuristic, streamlined design will confirm, still bug owners who want that slight breath of fresh air they got with a vent. Wind noise around window is another complaint. Owners wish to express their individual taste on dash layout. No complaints on automatic gear shift lever, shown here, but some owners find throw excessive with a four-speed manual. Workmanship complaints are almost all for the interior of an otherwise well-built car. Photos of specific problems are on page 142



and "tough looks," words of a New York secretary, are samples of how owners express what they like best. Over three-quarters of them would buy another AMX. When it comes to criticism, one happy owner is careful to point out that his remarks are "suggestions," not complaints.

Whether mildly or strongly worded, criticism of, or "suggestions" for, improving the AMX are most numerous when owners discuss the interior. Their dissatisfaction runs all the way from the floor to, in one instance, the droopy headliner. Owners appreciate the fact that the carpeting covers almost all of the lower interior of the car and goes all the way up to the

rear window in the area behind the seats, but there's a big "but."

As a New Jersey pipefitter says mildly, "good quality rugs, but very poor fit." His remark would contribute much to a Ralph Nader quality-control investigation, but that spurted out by a Washington aircraft research mechanic would blow the whole thing with both Management and Labor: "The interior rug must have been bought at the Salvation Army and installed by three-fingered deranged monkeys."

Getting down to particulars, an Illinois attorney speaks for several owners when he says the "rug doesn't fit the passenger

## Summary of 1969 AMX Owners Reports\*

Total miles driven: ..... 1,370,324

### Average miles per gallon:

290-cu.-in. V8, local driving 14.1  
long trips 16.9  
343-cu.-in. V8, local driving 13.2  
long trips 15.9  
390-cu.-in. V8, local driving 12.5  
long trips 15.5

### Specific likes:

Handling ..... 57.7%  
Style ..... 53.1  
Performance ..... 26.5  
Power ..... 24.0  
Comfort ..... 19.4  
Economy ..... 14.8

### Specific dislikes:

Workmanship ..... 22.7%  
Wind noise ..... 18.6  
Interior styling ..... 15.0  
Rear visibility ..... 10.8  
Transmission ..... 8.9  
Comfort ..... 7.7

### What changes would you like?

Better workmanship ..... 22.5%  
Better dash layout ..... 22.0  
Rear seats added ..... 11.5  
Vent windows added ..... 11.5  
Style ..... 7.3  
Bigger engine option ..... 5.2

### Engine:

290-cu.-in. .... 17.9%  
343-cu.-in. .... 21.4  
390-cu.-in. .... 60.7

### Transmission:

4-speed manual ..... 72.2%  
Automatic ..... 27.8

### Had any mechanical trouble?

Yes ..... 70.9%  
No ..... 29.1

### What kind of trouble?

Tachometer ..... 18.5%  
Transmission ..... 16.3  
Shifting ..... 15.2  
Clutch ..... 15.2  
Brakes ..... 10.9  
Carburetor ..... 8.7  
Window action ..... 8.7

### Dealer repair satisfactory?

Yes ..... 66.1%  
No ..... 32.1

### Why the AMX?

Style ..... 76.7%  
Price ..... 16.8  
Performance ..... 15.7  
Handling ..... 13.2

### Is the AMX your only car?

No ..... 53.6%  
Yes ..... 46.4

### Other cars owned:

Ford ..... 24.7%  
Chevrolet ..... 20.8  
Rambler ..... 14.9  
Oldsmobile ..... 14.9  
Cadillac ..... 8.9  
Buick ..... 7.9  
Pontiac ..... 6.9  
Dodge ..... 5.9

### What options/accessories?

Power steering and brakes 57.8%  
Radio ..... 43.5  
"Go" package ..... 22.3  
Power steering only ..... 17.3  
Wide oval tires ..... 17.1  
Airconditioning ..... 17.1  
Tinted glass ..... 17.1  
Disc brakes ..... 16.1  
Power brakes only ..... 15.6  
Mag wheels ..... 15.5  
Stereo tape ..... 11.9  
Light package ..... 10.9

### Age distribution of owners:

15-29 ..... 77.0%  
30-49 ..... 18.9  
50 plus ..... 4.0

\*Where applicable percentages may not equal 100 percent due to rounding and/or insufficient sample.





**MOLDING FIT** falls short in some owners' cars; a few found it not secured tightly

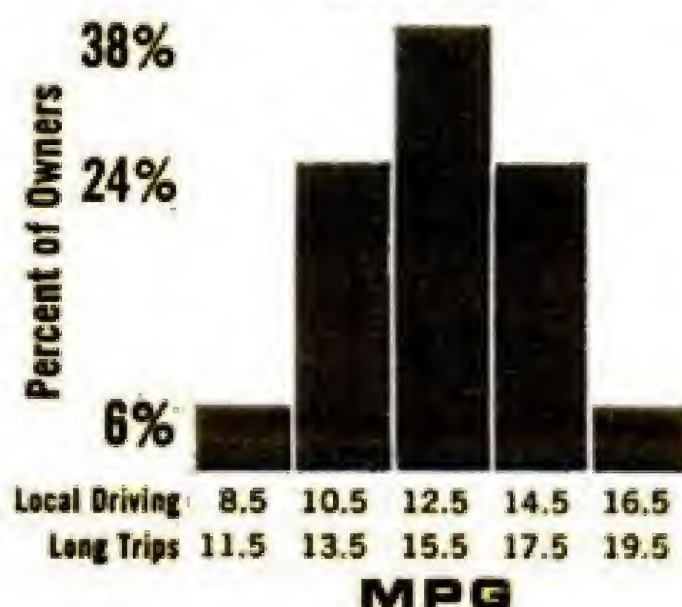


**WINDSHIELD SEALER**, squeezed out and not trimmed smartly, is minor complaint



**SLOPPY CARPET INSTALLATION** is big beef, but owners like copious use, quality

**AMX FUEL-MILEAGE CHART**  
390-cu.-in. V8



side. It was cut too short." "Carpeting looks like it was thrown in the car," complains a New Jersey serviceman. And a New York steel company employee is unhappy that the "interior is put together quite sloppily; I found numerous screws loose or stripped."

"Rug comes loose and unravels under the seats," continues a Connecticut key punch operator. "Carpeting seams are buckled and split, adds a Minnesota papermaker. The calm voice of a Massachusetts mechanic appraises the problem with a comparison: "My major dislike is that for a \$4300 car it looks cheap inside compared to other cars in its class."

► **AMX prices start at \$3297. That's with the standard 290-cu.-in. V8 and four-speed manual transmission.**

A substantial number of owners suggested modifications in the interiors of their 1968 AMXs (PM's survey was made before names became available for owners with '69 models). Many of these modifications have been made on the '69 cars. Among the suggestions is the use of wood: "I would like to see a wood dash offered. I redid mine in wood myself," says a Pennsylvania stockroom manager. "Needs a sporty grab handle," declares an Ohio draftsman. "Leather seats!" demands a Texas music teacher.

► **Wood-grain applique is now on center panel of dash, on door panels and armrests. Passenger grab handle is above glovebox. Leather seat option includes headrests.**

One modification some owners would like to see is not factory-available: "Milking stools could be used in the back for passengers," quips a Pennsylvania editor. Small, fold-down seats is the more practical suggestion of owners who are nevertheless happy with the omission of a built-in "ha-ha" seat, as a New York engineer calls it. The space behind the seats is "just right" for a variety of uses. It's perfect for carrying "drums and other instruments" for the musical moonlighting of a New Jersey hand glassblower; it's a car crib for the small baby of a New York computer operator; it's a playpen for the 20-month-old son of a West Virginia printer who says his boy is "as much at home in the AMX on a trip as in a station wagon"; it's great for the three children of a fun-loving Tennessee physician who says "they ride better and happier than in the old '63 Chevy"; it's fine for a pair of Irish setters of a Colorado lawyer; it's a perfect spot for the German shepherd dog of a West Virginia mechanic who says his dog "rides in it all the time and loves it"; and it's okay with other assorted animals, kids and sports.

As an enthusiast's automobile, it's natural that the car is bought by people who are concerned with every element of design that mates driver with vehicle, fuses man and machine. Handling for such owners means more than just how easily the



steering wheel turns. As an airline employee muses: "For me, handling always rates first, since performance can be had from most anything, but what happens when you meet that hard turn or otherwise need precise control of your car? So far, I've had a '61 Austin Healy 3000, '61 Porsche Super, '63 Corvair Monza, '65 Plymouth Sport Fury and '66 Mustang. Except for the Porsche, the AMX handles best."

Having this approach to driving, AMX owners are demanding of everything in their automobile's drive train from stick to slicks. The stock box in the AMX does not measure up to the standards of some owners: "Could be quicker and smoother," says a Maryland engineer. "Throw on the four-speed is too long and clumsy," complains a U.S. Air Force lieutenant. "Sloppy linkage in four-speed," says a California salesman. A Wisconsin computer technician complains about the "sloppy stick shifter and slight mismatch in gear ratios. He replaced the stock unit with a Hurst shifter. Other owners indicate the desire to do the same.

►All AMXs, as of last December, now have Hurst shifters as standard equipment.

Another minor complaint logged in this PM survey has also been remedied in a "running change" (one made during a model year). The problem was with the engine bonnet. Insufficiently reinforced, the leading edge of the hood would dent if it was pushed down too hard in closing it. A reinforcement has been added.

Owners who found that their hoods were acting like trampolines, even to the extent of denting, are not soured on the AMX by the experience. They seem to have learned to live with it and they just lower the lid with a little more care. Like the Pennsylvania technician who says, "I knew I wouldn't like not having a vent window before I bought the car," most of the owners adjust to the fact that their cars are not perfect.

Aside from any personal vows and woes, owners seem to appreciate that the AMX offers buyers something unique in sporty American cars. With all the sameness among them, that in itself is a good thing. Now that he has the car he has waited for, the Wisconsin computer technician we've already heard from concludes: "I expect to keep my AMX for a long, long time." ★★★



**AMX STYLE** sold the car to overwhelming percentage of owners who compare it to European designs



**BACK-SEAT AREA** is praised as perfect for babies and young travelers, even 80-pound German shepherds



**TRUNK SIZE** is okay, but some owners prefer a full-size spare, even if it's larger than fold-up type





Good, solid construction features are the mark of real quality

## HOME BUYING

**OUTWARD SIGNS** can sometimes fool you. Top-grade materials, like the hardwood parquet flooring at left, are usually a genuine indication of long-lasting, quality construction. But eye-catching features, like the breakfast bar, kitchen pass-through and luminous bathroom ceiling shown on the opposite page, are sometimes used as a "come on" to divert your attention from low-grade materials, shoddy workmanship or a poor house plan. Some important factors, like adequate insulation and roofing quality, cannot be judged readily by eye—you have to ask about them. Asphalt shingles, for instance, should have a minimum weight of 235 pounds per square and be either interlocking or self-sealing to stay down well in high winds. Don't accept less

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AVOID THE 10 BIGGEST HOME-  
BUYING TRAPS by A. M. Watkins.  
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# How to Spot a Bad

By **A. M. WATKINS**, author of the new book,  
*How to Avoid the 10 Biggest Home-Buying Traps*

Often gimmicked up to catch your eye, the marginal home can seem like a great buy—until you've lived in it for a while. Here, an expert tells you why good construction and top-grade building materials pay off and how to be sure of getting them

POPULAR MECHANICS

*Материал, опубликованный авторским правом*



**T**HE MARGINAL HOUSE is one that just squeaks by. Its construction and the parts that went into it are of minimum quality, just good enough to get by minimum standards. It's not necessarily a sub-standard house. The house very likely came up to the local building code, sometimes even to the Federal Housing Administration's minimum standards, but nevertheless it's a marginal house.

One couple knows well the trouble, irritation and extra expense a marginal house represents. There was the summer vacation that went down the drain because money was needed for a new paint job, though at the time the house was a mere three years old. There were the chilly children's bedrooms that were impossible to heat during cold weather, in addition to high fuel bills. There were the paper-thin walls and the cheap paneling that looked deceptively handsome when they first moved in but soon began to wear thin and look tawdry. And there was also the low-grade flooring, especially in the kitchen and bathroom, which was impossible to keep clean and good-looking.

The lowest-grade economy materials are used widely in house construction to keep down costs. They actually cost you money in the long run. In time, their performance tails off. More and more upkeep and maintenance are required. They add up to a marginal house that becomes a

Fancy extras are nice to have but shouldn't mask poor workmanship



# House That Looks Good

growing source of nagging annoyance and bother.

Moreover, really good, if not topnotch, quality building products often cost only a little more than the lowest-grade ones. The very best quality house paint, for example, costs only a dollar or two more per gallon than the minimal grade usually used on houses. Using that best paint on a typical \$25,000 house will increase total paint cost by a mere \$15 to \$20.

High-quality flooring, paneling, wiring, heating and many other products similarly cost only a little more, by and large, than the same products in marginal quality. Studies show that the initial price of a house built with high-quality materials will run no more than 8 to 10 percent more







**EXTRA-THICK INSULATION**, like these 6-in. batts between ceiling joists, indicates good construction

than the price of an identical house built of marginal quality. You will get that extra cost back plus a dividend each month after you move in. The studies show that the high-quality house will save you, on the average, about \$250 to \$300 a year on upkeep, maintenance and inevitable repairs.

A young couple bought a \$24,500 house in a new development we'll call Highway Acres. They bought it principally because of a luminous Japanese ceiling in the downstairs bathroom. It was a distinctive, eye-catching feature, a suspended light screen indirectly illuminated by recessed lights above. It turned out later that more than half the buyers of the 80 houses in Highway Acres also bought largely because of the luminous ceiling feature.

Surveys show that houses are often bought because of one or more distinctive features that trigger the buying impulse. The trouble is that such features are often gimmicks, put there deliberately to catch the eye of buyers. The houses in Highway Acres are marginal house-traps. Measured against any standards, they are of miserable design. The interior floor plans,



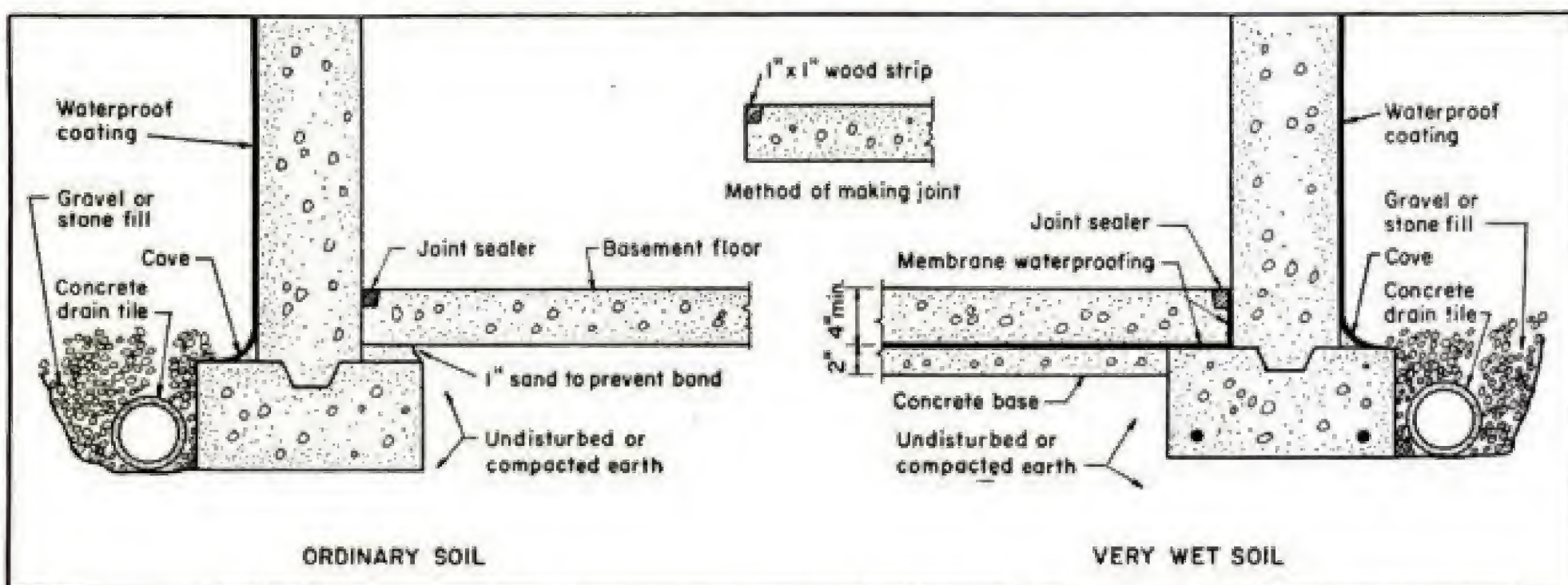
**IN WET AREAS**, foundation drain tiles can make all the difference between a dry or flooded basement

by and large, are nightmares for living. The kitchens are singularly small and ill-planned. And the construction is marginal, if not of downright shoddy quality. Yet the irresistible appeal of the Japanese ceiling so overshadowed the implicit flaws that the builder sold some \$2 million worth of marginal houses at an extra cost of about \$65 per house (the estimated cost of the glamor ceiling).

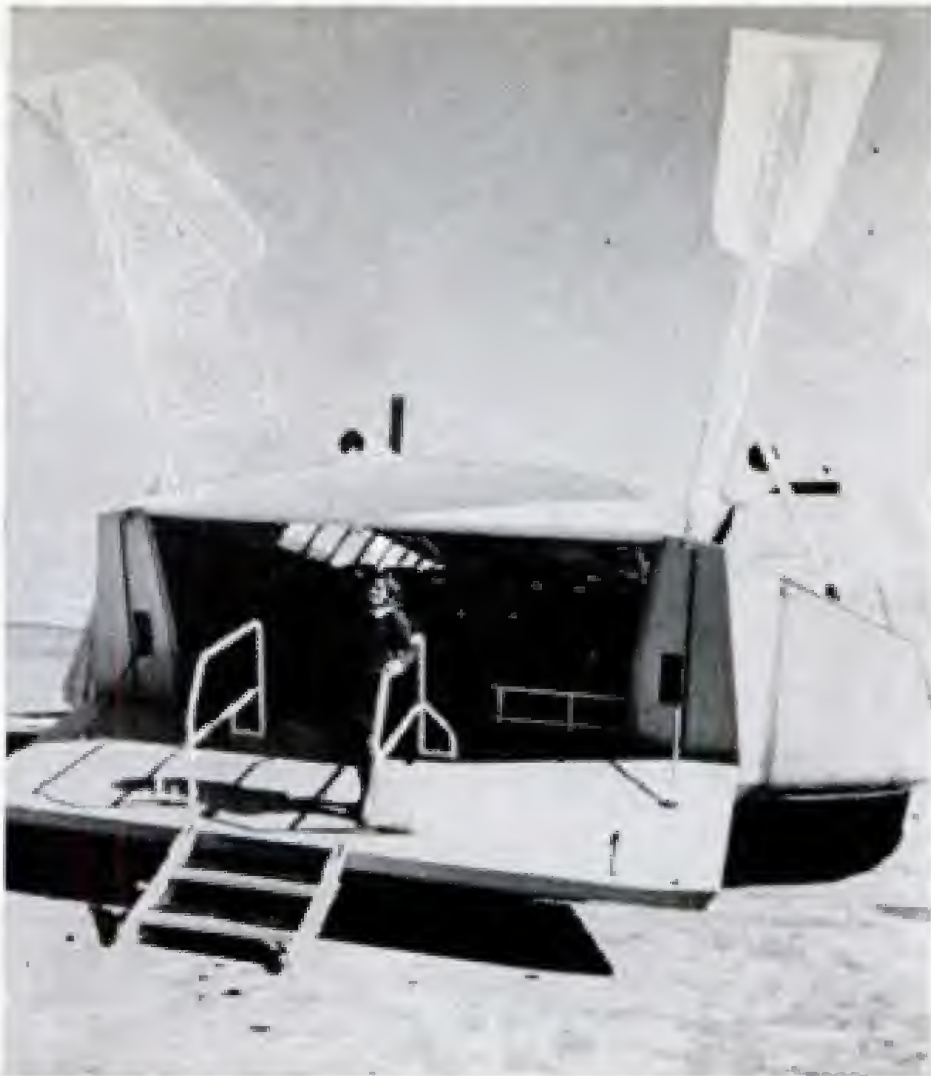
The gimmicks used to sell houses take a variety of shapes and forms. They include fancy kitchen trappings like a dining

*(Please turn to page 228)*

**CHECK THE PLANS** for items not visible to the eye, such as an adequate underground waterproofing system







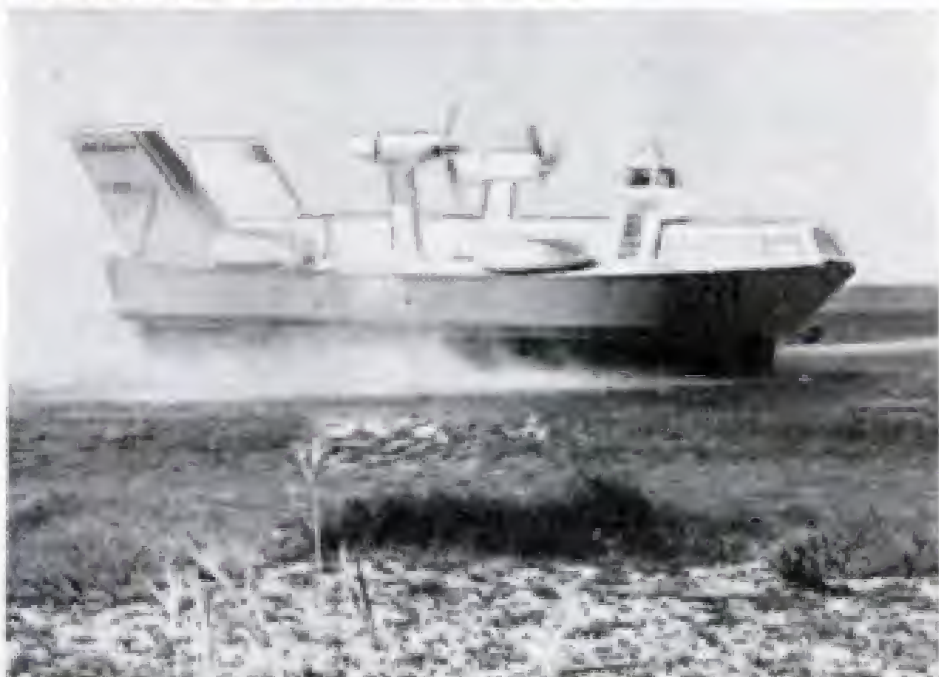
## Nose job for KC-135

Huge noses have been added to eight KC-135 jets to house parabolic antennas. These and other special gear enable the planes to be a link in ground-to-Apollo communications.



## Now they whisper

Engine noise from training planes has been reduced by about 30 percent by Lufthansa engineers at the airline's flying school in Bremen. The noise suppressors are simply extensions fitted to the exhaust stacks. They call the trainers "whispering airplanes."



## French air-cushion vehicle

The French are testing an air-cushion vehicle, the Naviplane, that they intend to put into use as a passenger ferry. The machine is currently capable of carrying 90 passengers at a speed of about 60 mph. Speed will later be pushed up above 70 mph.



## Skyservants for America

The Dornier aircraft plant near Munich is turning out 52 Skyservant planes for the U.S. firm, Butler Aviation. Each Skyservant can carry 12 passengers.





## THE DROP-IN FILM CARTRIDGE HAS COME TO STAY



The handy instant-load cassette, widely used in simple cameras, is now showing up in shiny new single-lens-reflex models, combining convenience with advanced features for the serious amateur

By **SHELDON M. GALLAGER**

**T**WO GREAT DEVELOPMENTS in photography have finally gotten together. The result is a brand-new breed of camera that combines the simplicity of the instant-load film cartridge with the versatility of the long-proven single-lens reflex.

The new cartridge-loading SLRs look

and work much like the trim, popular 35-mm single-lens reflex. They use the same mirror and prism arrangement that lets you see what you're shooting through the actual lens that takes the picture. The difference is that there's no threading of film to do, no spools to fuss with and no rewinding. All you do is open the back,





**YOU CAN USE FLASH CUBES** or electronic flash with this Ricoh 26C-Flex—it has sockets for both. Like other cameras shown here, it takes drop-in cartridges, gives you choice of interchangeable lenses



**MODELED AFTER** traditional 35-mm SLRs, the Contaflex has a focal-plane shutter, behind-the-lens exposure meter and accessory flash shoe on top. Four lenses from 32 mm to 135 mm are available for it



**SMALLEST OF THE FOUR**, the Rolleiflex SL26 is less than four inches wide and weighs only 19¾ ounces. Available lenses include a 40-mm normal, a 28-mm wide-angle, and an 80-mm moderate telephoto



**KODAK'S INSTAMATIC REFLEX**, like the Ricoh, has provision for both flash cubes and electronic flash. You can get seven different lenses for it, from a 28-mm wide-angle to telephotos of 135 and 200 mm

drop in a cartridge (they all take the 126 cassette) and start shooting.

To date, four well-known makers have brought out instant-loading SLRs, and it's a safe bet that others will follow suit. Kodak, which pioneered the cartridge idea for simple cameras, now has its own Instamatic Reflex, a sophisticated SLR designed especially for cartridge use. Other new SLR cameras using the instant-load principle are the Rolleiflex SL26, the Contaflex 126 and the Ricoh 126C-Flex.

All of the cameras offer interchangeable lenses ranging from wide-angle types to long-focus telephotos. All have modern behind-the-lens light meters and a full range of adjustable exposure settings. On

most, the exposure is set automatically for you, but can be overridden if you want to create special effects.

In line with the move to the simpler film cartridge, two of the cameras have provision for using handy, disposable flash cubes as well as electronic flash. These are the Kodak and the Ricoh. The Contaflex and Rolleiflex have accessory shoes that take external flashguns.

Cartridge films are multiplying almost as fast as the cameras that take them. Already, there are half a dozen on the market in a variety of types and speeds. Kodak offers a medium-speed black-and-white, two color-transparency films in medium and high-speed types, and a negative





**JUST OPEN THE BACK** and plop the cartridge in—it's that simple. This Rollei has a "hot" flash shoe on top that takes a flashgun without a cord

**SOME OF THE MANY CARTRIDGE FILMS** now available are these from Kodak. They include a black-and-white and two color-transparency types, one medium-speed and one high-speed. Anscochrome and 3M's new Dynachrome also come in cartridges in several types

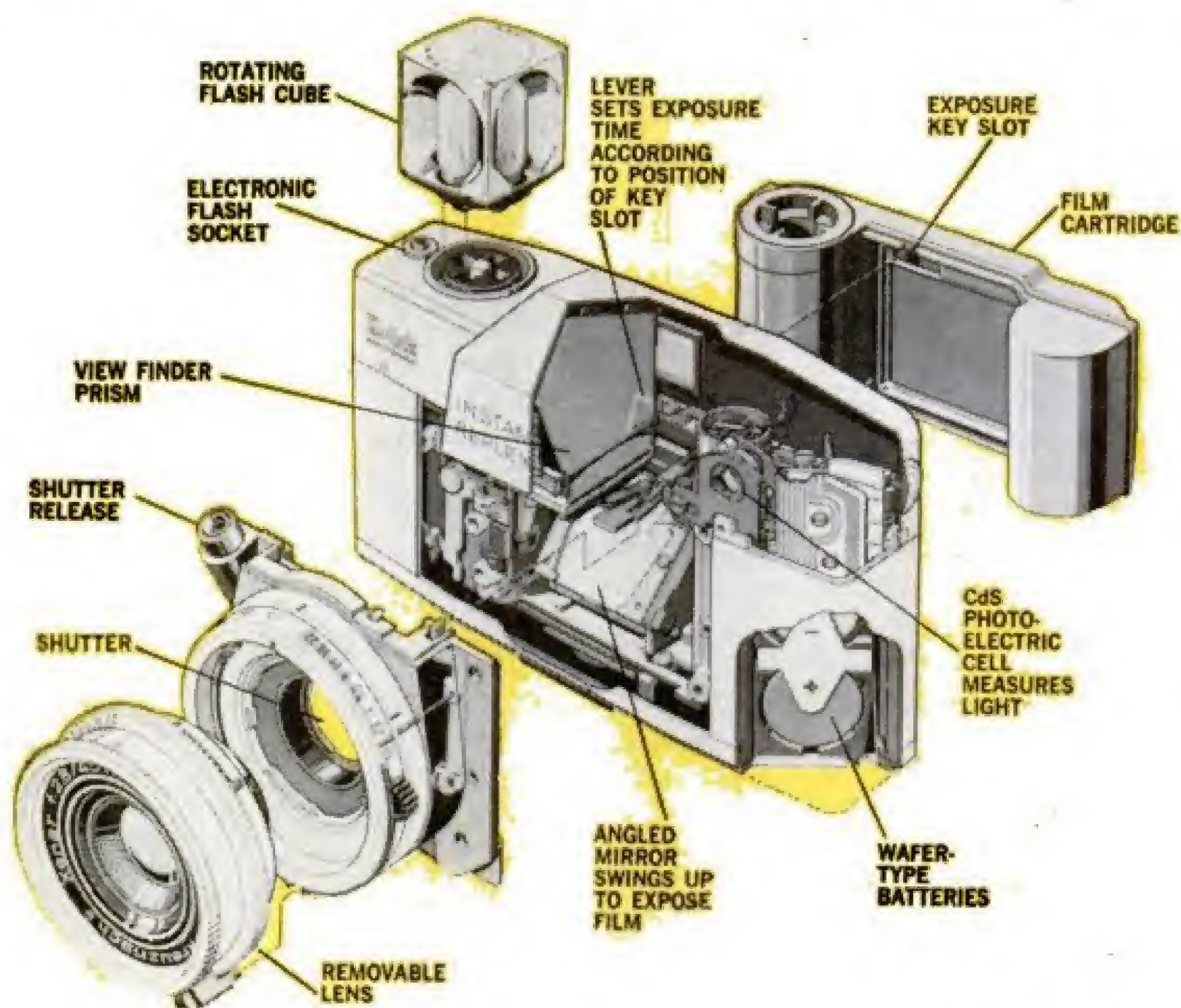
film for color prints. Anscochrome and 3M's new Dynachrome also come in cartridge form in several different types.

The cartridges are designed so you can't accidentally put them in the wrong way. An identifying notch in the side tells the camera what film you're using and automatically sets the exposure for the correct film-speed index.

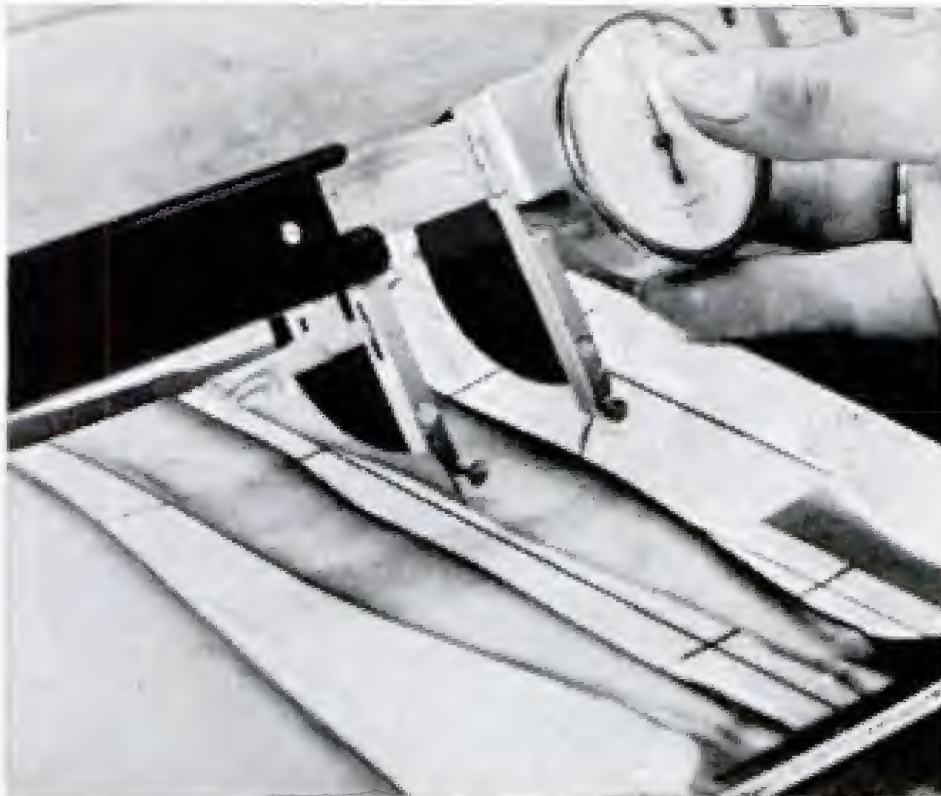
**ONE BIG ADVANTAGE** of the cartridge system is that the camera's exposure meter is set to the correct film-speed index automatically—you don't have to bother with it. Each cartridge has a small notch

Prices for the new cameras vary, as do some individual features. Kodak's Instamatic Reflex goes for just under \$200 with a normal-focus 45-mm, f/2.8 lens. Rollei's SL26 reflex lists for \$299.50 with a 40-mm, f/2.8 lens. The Contaflex 126 sells for about \$160 and the Ricoh 126C-Flex for about \$120, both with standard-length lenses. ★★★

that indicates the film speed by its location. As the cartridge is inserted, the notch engages a lever, that adjusts the meter to the proper setting, as shown in this cutaway of Kodak's Instamatic Reflex







## Scientific leg show

Citing evidence that body build can be informative, a team of researchers at Aston University in England is photographing the legs of 1000 girls (above) to learn if the legs will reveal personality, social status and place of birth. Measurements are made on each photo (directly above); samples at right.



## Contractor's office building has wings

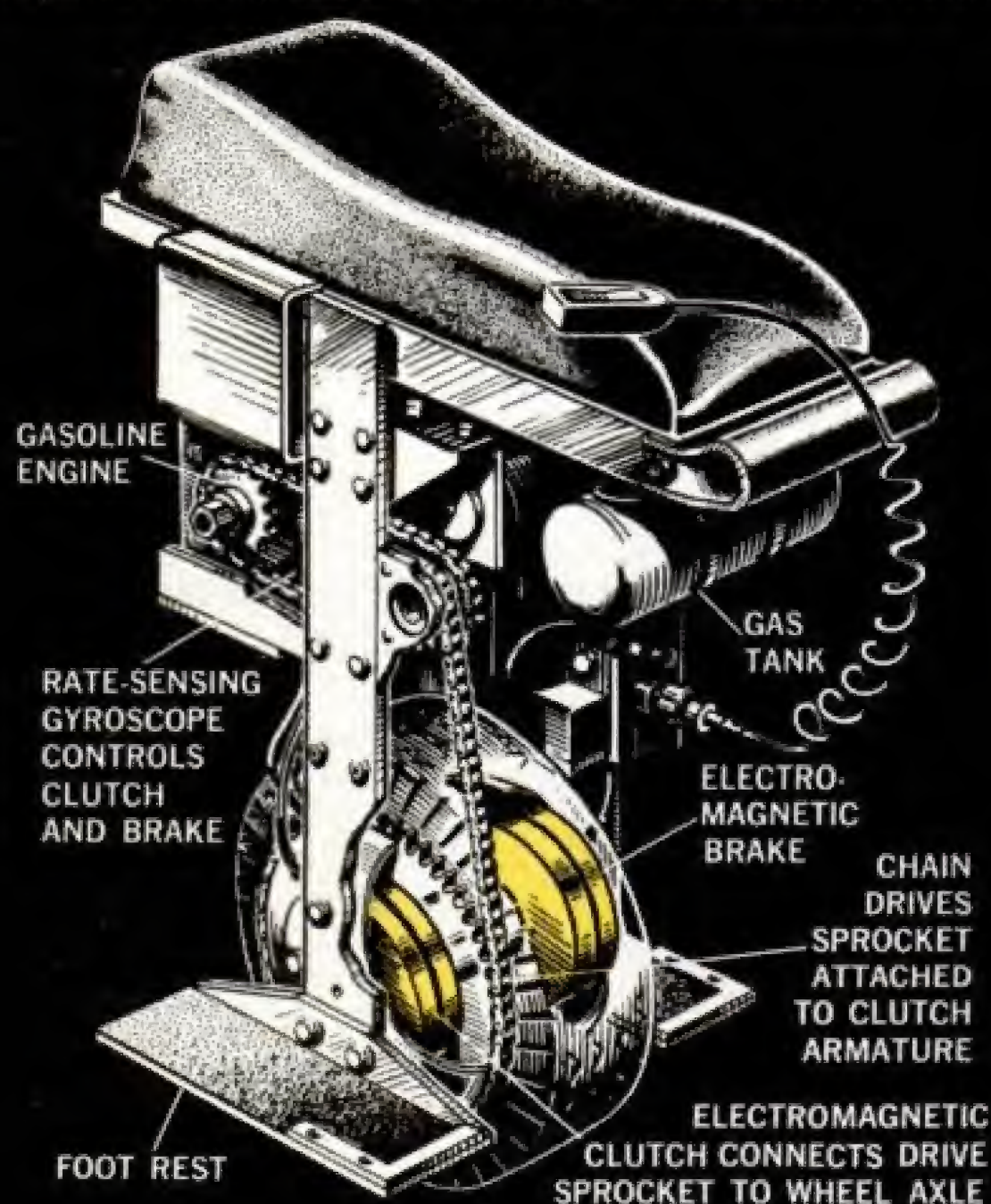
Two 300-ton wings, cantilevered from a rectangular center section, create an unusual office building for the W.J. Megin contracting firm in Naugatuck, Conn.



# Just patented

## PM'S PICK OF THE NEW INVENTIONS

Prepared in cooperation with Roger S. Shashoua, Director, International Inventors Association, Inc.



GYROSCOPE SENSES BACKWARD FALL AND SLOWS UNICYCLE DOWN

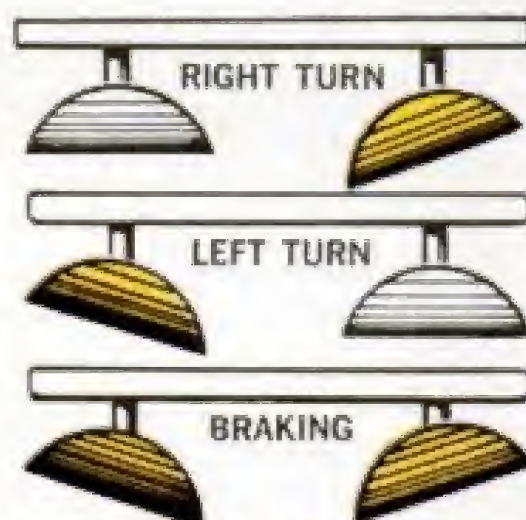


GYROSCOPE SENSES FORWARD FALL AND SPEEDS UP UNICYCLE



**1. WHAT COULD BECOME A NEW SPORT THRILL** is this gas-powered unicycle that can do twists, turns, panic stops and other acrobatic maneuvers without falling. Earlier unicycles attempted to use gyroscopes to keep upright, but weren't successful. This new design uses a gyroscope, but not to stabilize the machine itself—merely to sense which way it is falling. If it tips forward, the gyroscope automatically increases speed to counteract the fall. If it tips backward, the brakes go on to force it forward. It can also be operated by a hand control without the gyroscope, requiring more skill. An electromagnetic clutch and brake provide smooth, precise control

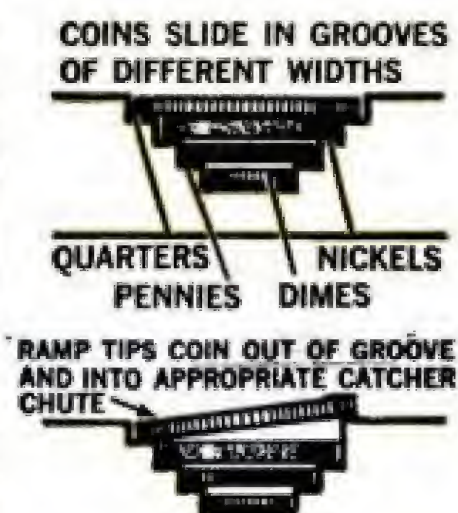
**2. THE RUNNERS TILT** instead of turn to steer this unusual sled. Each one is controlled separately by a handle at the side. Pulling on the left-hand handle causes the left runner to tilt inward, forcing the sled to the right. Pulling the right-hand handle steers the sled to the left. The system provides more steering action than the fixed runners on a child's sled, yet costs less than the pivoted runners used on bobsleds. Also, tilting both runners together produces a snowplow-like braking action for good control



(RUNNERS VIEWED FROM FRONT OF SLED)

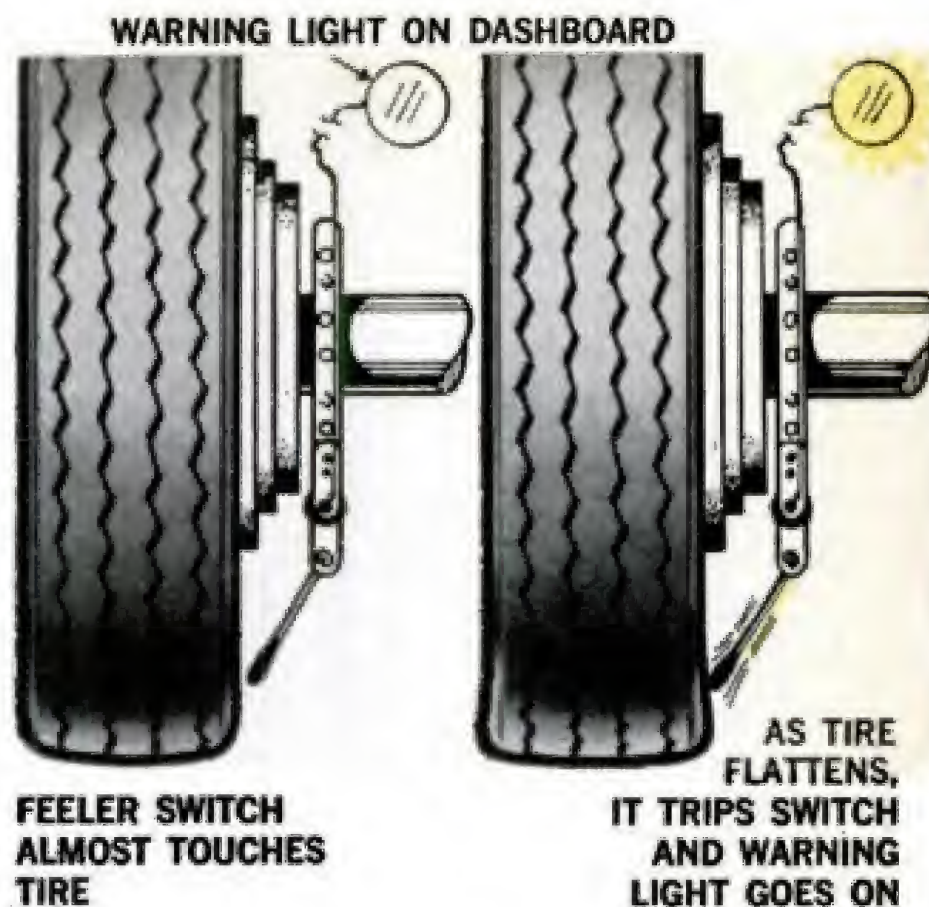
Inventors of the items shown on these pages are as follows: 1. Frank Malick, Franklin Control Co., 518 Greenleaf Drive, Monroeville, Pa. 15146; 2. Josef Schroll, Bad Tölz, Germany; 3. Ronald C. Gdonski, Montreal, Canada; 4. Lichtenfeld & Co.,



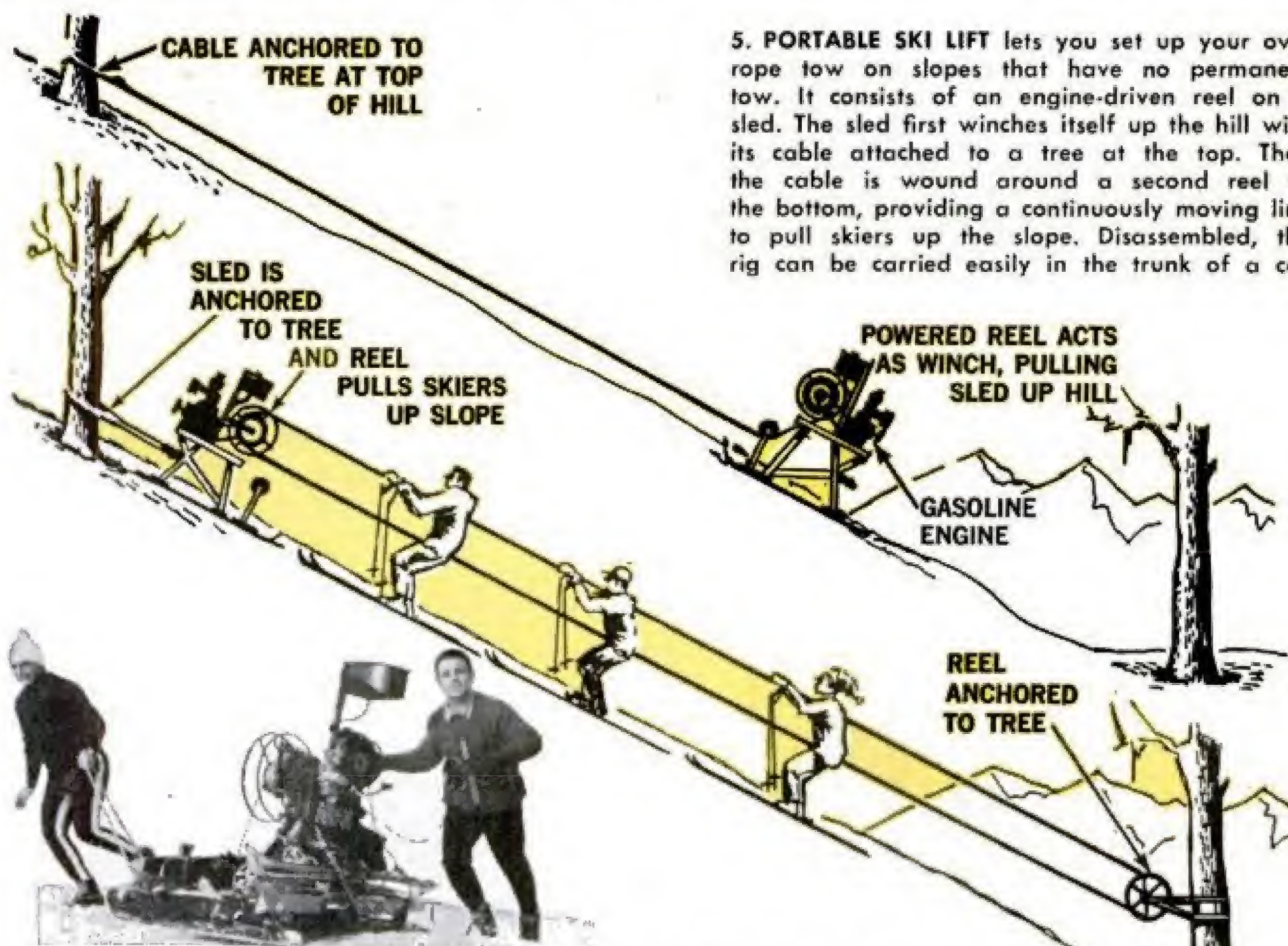


OTHER COINS CONTINUE ON INTO DIFFERENT CHUTES

**3. DROP A HANDFUL** of mixed coins into the top of this plastic slide and they automatically end up at the bottom in four neat stacks, one for nickels, one for dimes, one for pennies and one for quarters. The ingenious sorter uses a system of shallow grooves—one for each size of coin—to catch the different denominations and guide them in different directions. Near the bottom, tiny ramps tip the coins out of the grooves and into each one's appropriate collector slot



**4. A FLAT TIRE** wouldn't catch you off-guard with this warning device. At the first sign of a leak, a red light on your dashboard flashes on, giving you time to find a service station or get safely off the road before the tire goes completely flat. A tiny feeler wire is mounted inside each wheel so that it almost touches the tire in normal driving. If the tire starts to lose air, the feeler senses the increased bulge in the casing, closing a switch that turns on the warning light. By using four separate warning lights, it's possible for you to pinpoint which of the tires is at fault before you even get out of the car



**5. PORTABLE SKI LIFT** lets you set up your own rope tow on slopes that have no permanent tow. It consists of an engine-driven reel on a sled. The sled first winches itself up the hill with its cable attached to a tree at the top. Then the cable is wound around a second reel at the bottom, providing a continuously moving line to pull skiers up the slope. Disassembled, the rig can be carried easily in the trunk of a car

Hamburg, West Germany; 5. Arturo Panetta, Reggio Calabria, Italy. Anyone interested in bringing new inventions to the attention of Roger Shashoua can reach him at the International Inventors Assn., Inc., 680 Fifth Ave., New York, N.Y. 10019.



# Five Weekend

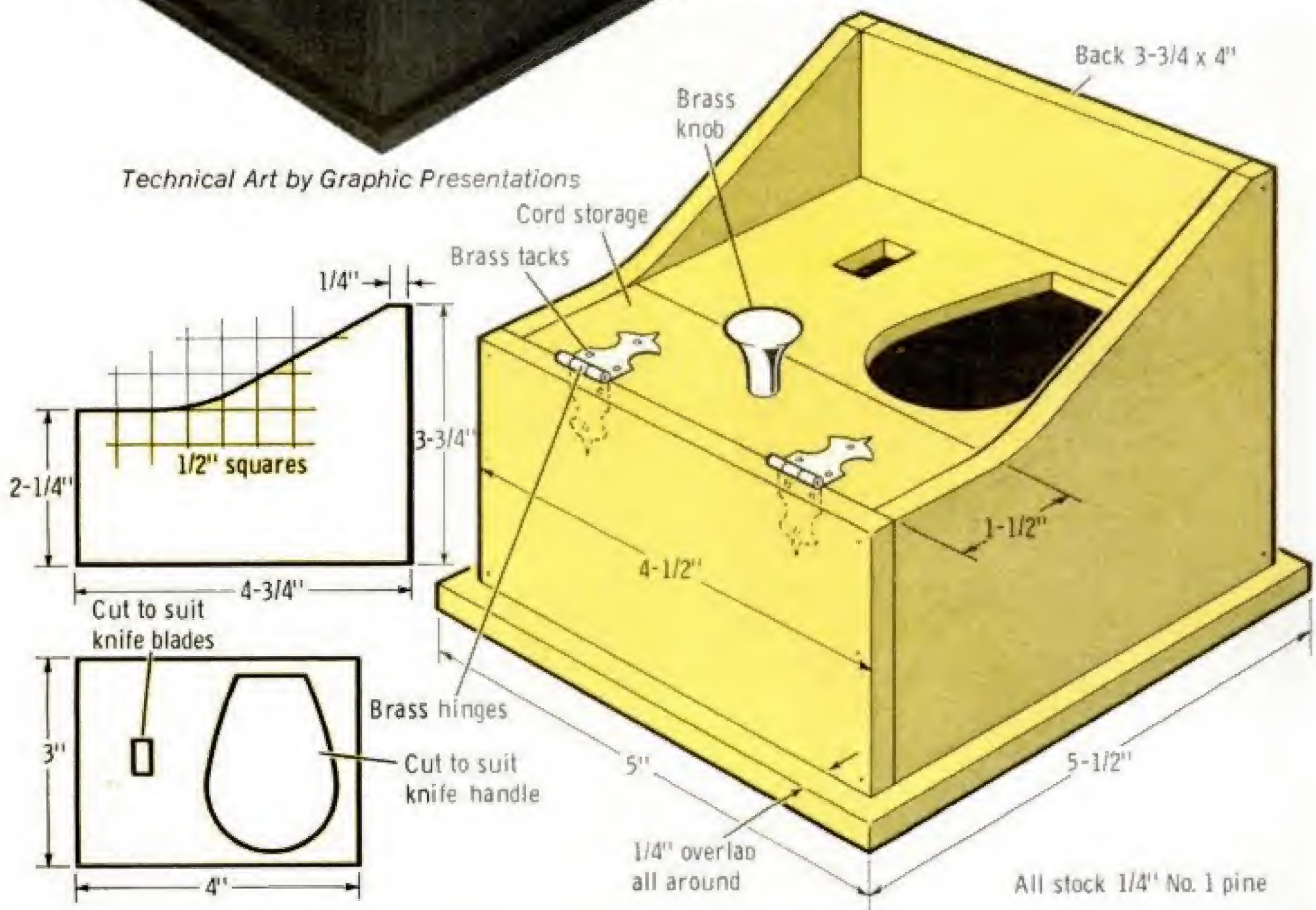
## Counter Knife Holder

**W**HAT DO YOU DO when you have an electric carving knife that's designed to hang on a wall and there's no wall to hang it on? You chuck it in a drawer where it's out of sight and soon out of mind. That's what happened at our house until I made this neat little holder which let us store the knife right on the kitchen counter. There's a place in the front for the cord and separate stalls for blade and handle.

I cut it out and put it together one night and stained and finished it the next—it's that simple to make. I made the whole thing from  $\frac{1}{4}$ -in.-thick pine, but plywood will do just as well. Both sides are alike. The back fits between the sides, the front laps the sides and the bottom projects  $\frac{1}{4}$  in. all around. "Holes" in the fixed shelf are made to suit the blade and handle of your particular knife. Tiny brass hinges are used to hinge the lid, one leaf being applied to the inside. A brass knob completes it.—*Lynn R. Mortensen*



Technical Art by Graphic Presentations



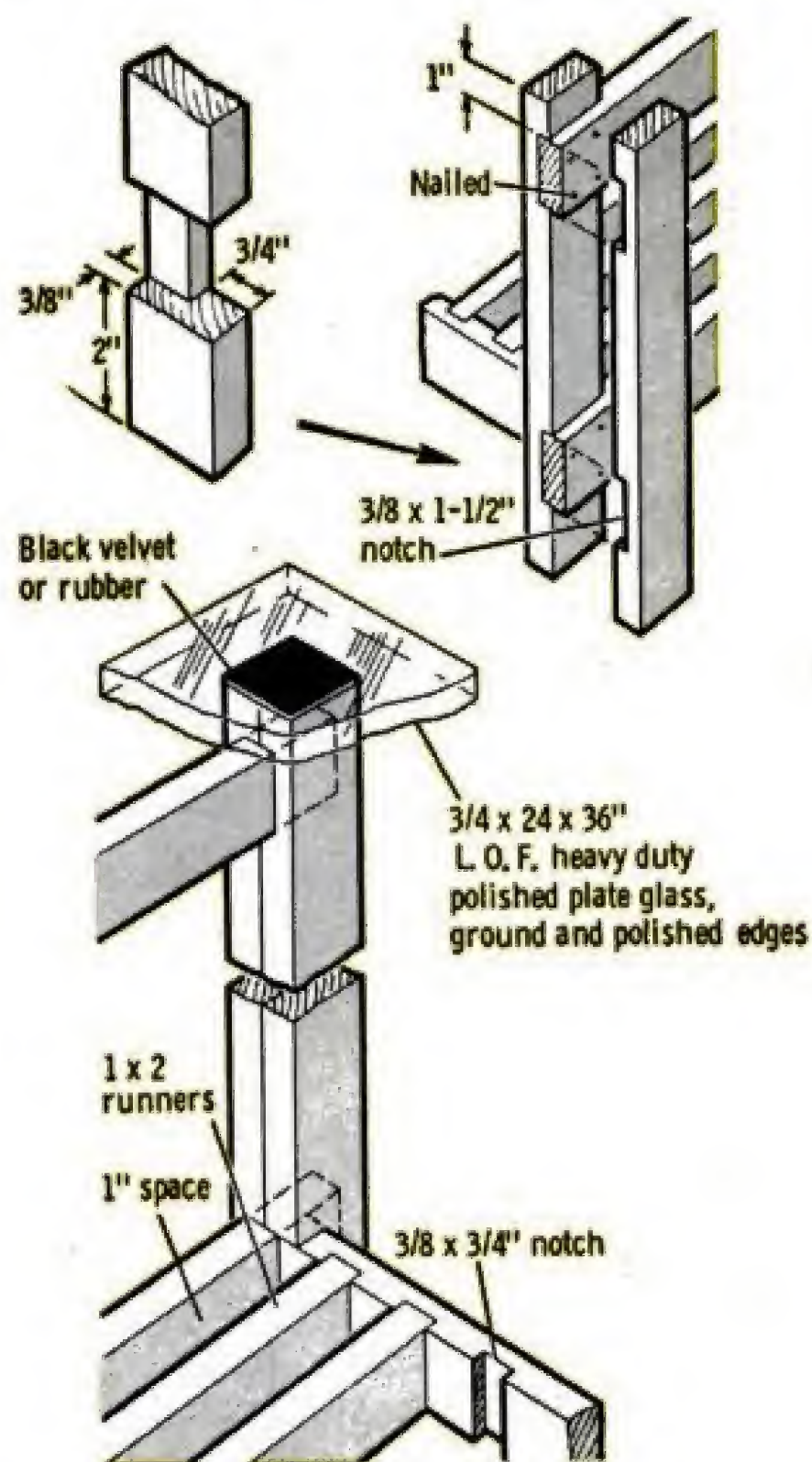
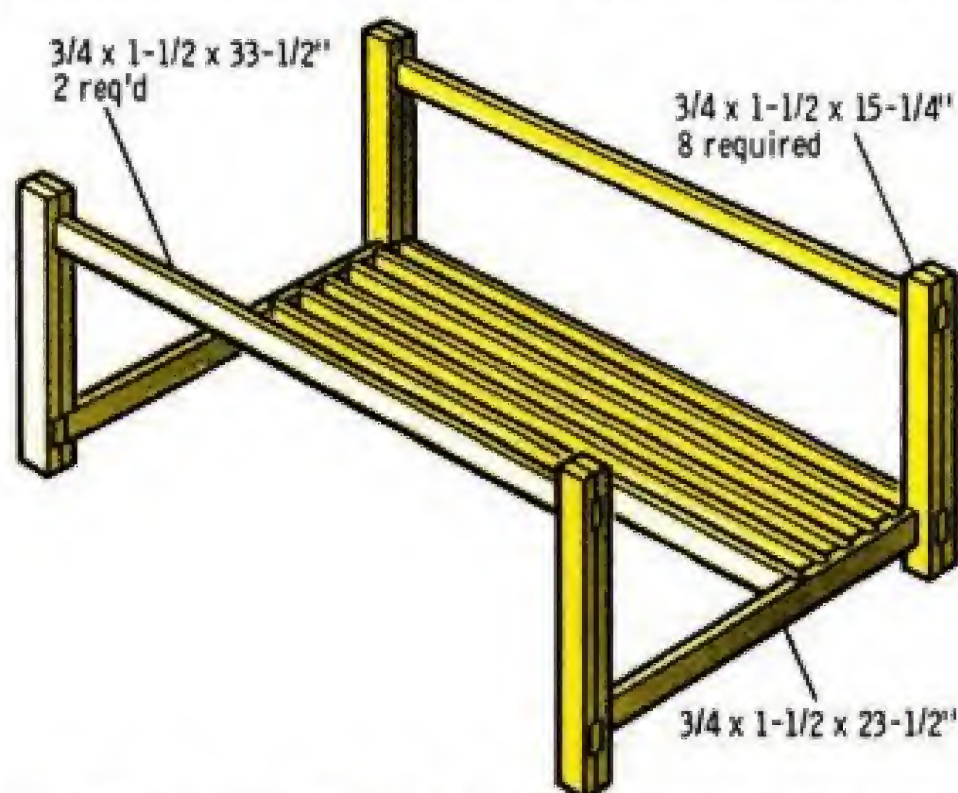


# Projects to Build

## Glass-Top Coffee Table

IF YOU'VE PRICED them lately, you know that glass-top coffee tables are not cheap. In New York City you'll pay up to \$45 for the top alone. You couldn't find this elegant table in a store for less than twice as much.

The cost is all in the top, really, for the base of 1x2s can be pine and painted black, or hardwood and varnished. Post legs are double-thick and notched to house the crossrails. Five rails across the bottom provide a magazine shelf. Any Libbey-Owens-Ford glass distributor can provide the  $\frac{3}{4}$ -in.-thick ground-edge top.



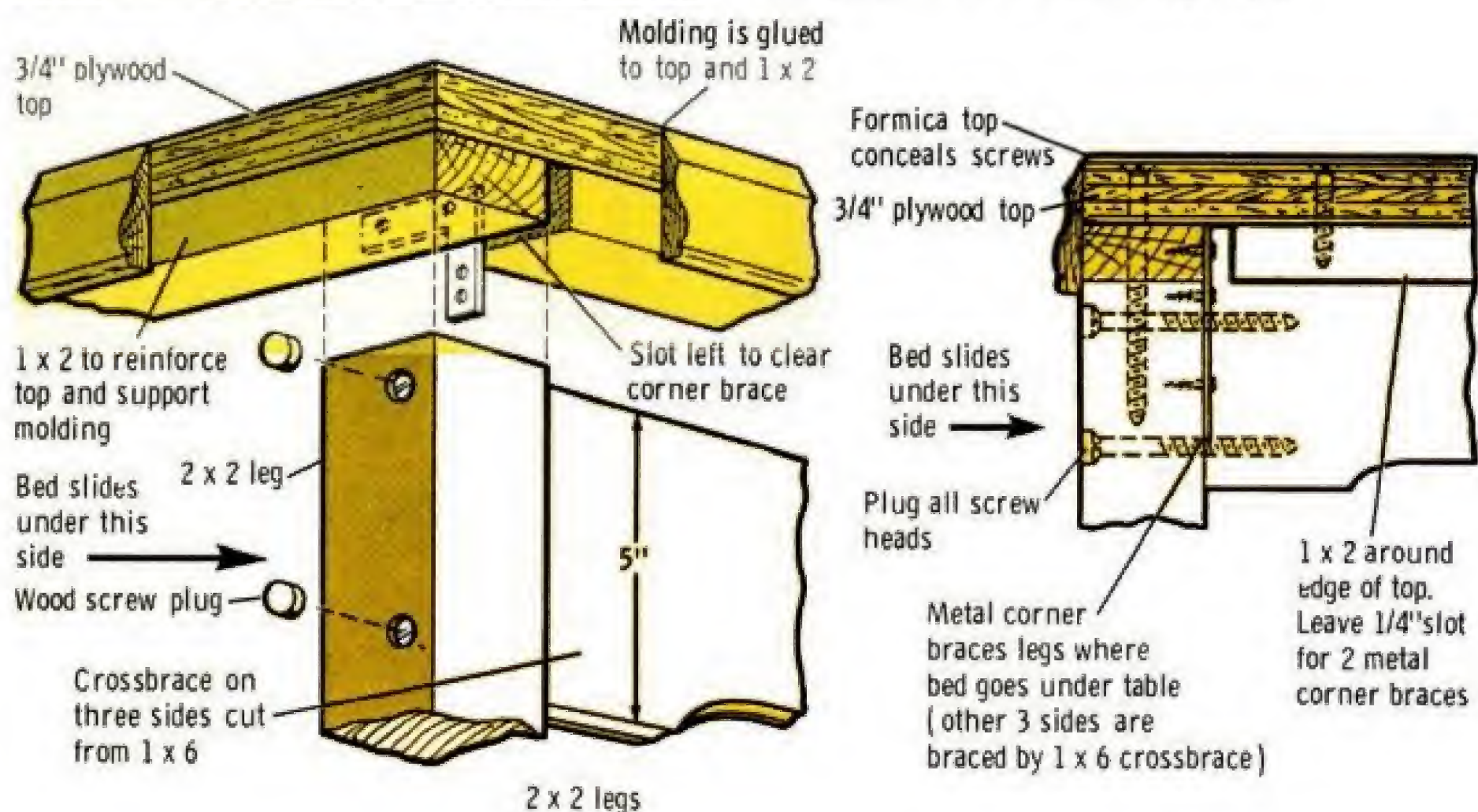




## Twin-Bed Night Table

TALL ENOUGH to let one bed slide under it when not in use, this clever corner table not only provides a handy night table for two beds, but saves space in a small room shared by brothers or sisters.

Built something like a card table, except that the legs don't fold, the table has aprons only on three sides. It's made from stock lumber, 2x2s for the legs, 1x6s for the aprons, 1x2s for the cleats, plywood for the top, and ready-made molding for the edges. Metal corner braces anchor the legs. Wood screw plugs hide screwheads in the legs, while plastic laminate hides screwheads in the plywood. The molding around the top is neatly mitered at the corners.—Robert L. Hoppough





## Circus-Wagon Toy Box

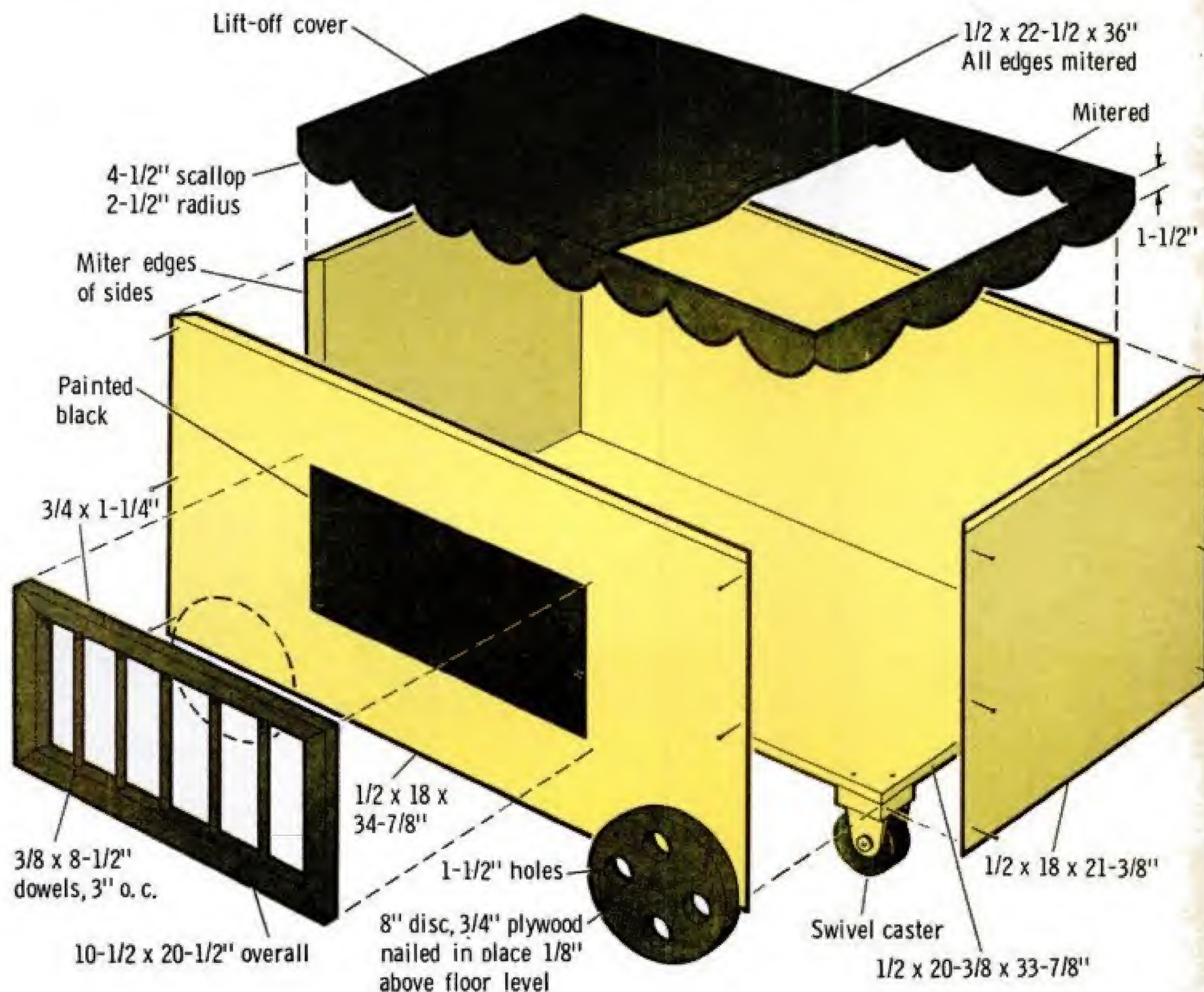
LOOKING LIKE A TOY ITSELF, this roomy caster-fitted "animal wagon" adds a circus touch to Junior's room and, more important, goes a long way in corralling toys galore. Except for the frame which holds the dowel bars,  $\frac{1}{2}$ -in. plywood is used throughout. For the most part the wagon is nothing more than a four-sided box with a lift-off cover.

I mitered all the corners to obtain the neatest joints for finishing, but if miters are a problem, you can simply butt the corners. This goes for the top also. Any tin can having a 9-in. diameter can be used to lay out the scallops.

Swivel-type plate casters screwed to blocks are partly concealed by dummy wagon wheels which clear the floor by about  $\frac{1}{8}$  in. A colorful animal picture is pasted in place before bars are fastened with screws from inside.—*Marilyn Cann*



**PAINTED IN LIVELY COLORS**, this novel toy box will add a gay touch to any youngster's room. The top could be made to hinge open rather than lift off



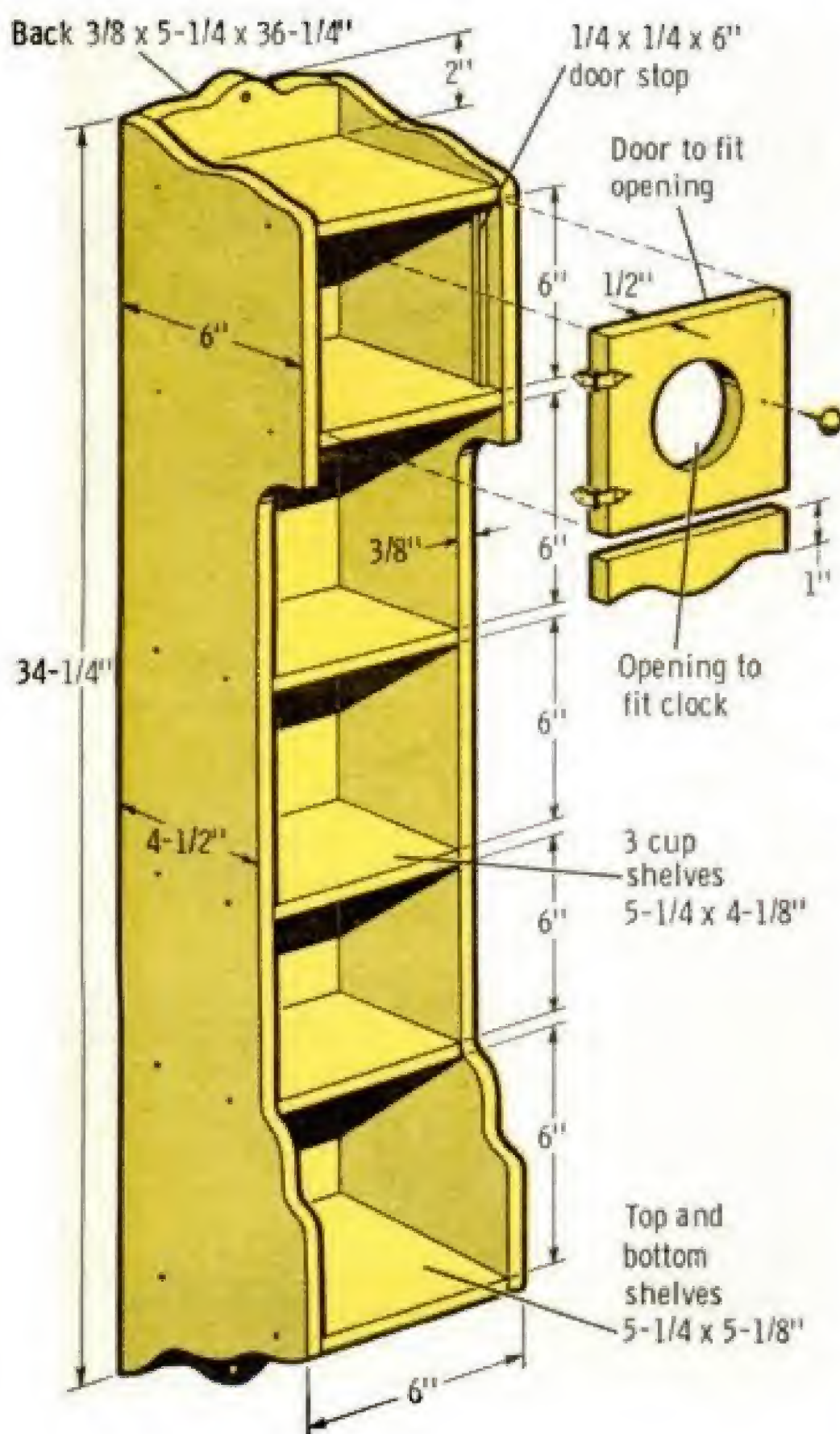


## Clock and Cup Shelf

A SPARE ALARM CLOCK, or any electric movement for that matter, will make this handsome Early American wall shelf do double duty. It's just the thing for those narrow wall spaces in your kitchen and perfect for displaying decorative shaving mugs or other prized bric-a-brac.

I used old, wormy cherry salvaged from a chest of drawers to make it. As you see, both sides are duplicates which I bandsawed together. All shelves are the same width, but some are made deeper than others. The hole in the door to the clock compartment is jigsawed to suit the clock face and is made for a press fit. Appropriate strap hinges are selected to hinge the door. A small knob opens it and a magnetic catch holds it shut. You can preserve the natural finish of the wood by applying a sealer, stain or wax.

—Don Shiner



**YOU'LL BE GLANCING** at this charming shelf for two reasons: It's just plain pretty and it tells the time

**WHILE I MERELY BUTTED** the shelves between the sides and clamped them, they could be set in dados





# PHOTO HINTS



**GETTING PETS TO POSE** is exasperating. This trick with an alarm clock works well with cats and may be useful for other animals. Set the alarm to go off in a few minutes. The ticking will attract and hold the cat's attention. When the alarm sounds, the cat will react with surprise or anger, perhaps even attacking the clock, as did the one shown here. It's usually possible to get several good action shots during this period. The louder the clock, the better—you'll find the old-fashioned wind-up type is ideal



Cat eyes clock, intrigued by ticking



As bell sounds, he attacks. Take that!



**EVER PUT YOUR CAMERA AWAY** with a half-finished roll of film in it and then forget what film you were using? This handy tag not only identifies the film for you, but it also supplies useful data on exposure settings and flash guide numbers. Use a plastic sleeve of the type sold for identification cards and wallet photos. Punch a hole in one corner for a small key chain. Slip the data sheet from the film box into the sleeve and fasten the chain to a strap ring on the camera. Make one up for each type of film you use and you'll always have the right information at your fingertips.—Ken Patterson

**SMALL CAMERA ACCESSORIES** rattle around a gadget bag unless you store them in individual holders. If your bag didn't come fitted with pockets, you can add them easily this way. Cut perforated hardboard into small pieces and thread elasticized ribbon through the holes to form loops, as shown at right. By varying the spacing of the loops, you can make them wide or narrow to take the different accessories. One board can be made to fit inside the bag's lid, and others can be slipped down along the sides. Elasticized ribbon is sold at sewing counters in department stores and variety shops.—Arthur L. Ramos





How to install  
a rebuild kit and

# PUT LIFE BACK IN YOUR CARBURETOR

By MORT SCHULTZ



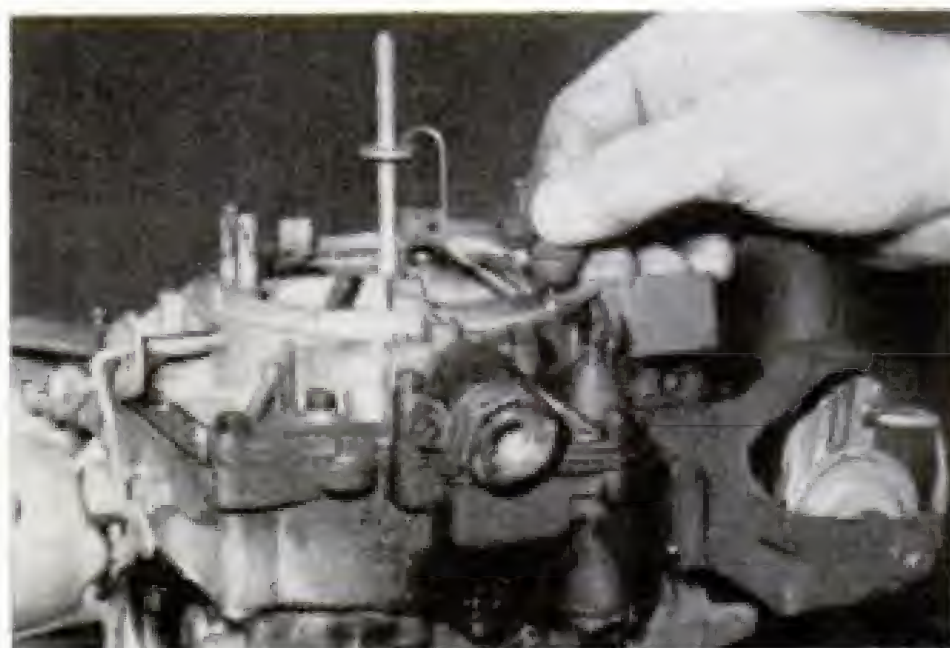
**T**EARING APART a carburetor for cleaning and rebuilding isn't easy—especially if you're working with four barrels. But if you keep your cool, you can do as good a job as any professional in a couple of hours, and the outcome is certainly rewarding.

Illustrating the job is the overhaul of one of the most complex carburetors ever made—a Rochester 4GC (four barrel), which was taken from a 1964 Oldsmobile Cutlass. If you think you can do the work on this carburetor, you can certainly overhaul a much simpler one or two-barrel carburetor that you may have on your car. The procedure is generally the same as that outlined here, except that you'll have fewer parts to fool with on a single or dual-barrel job.

Professional mechanics, incidentally, get up to \$40 for overhauling a four-barrel carburetor, approximately \$30 for a two-barrel carburetor, and \$20 to \$25 for single-barrel jobs. Your cost if you do the work yourself is about \$15—\$6.50 for a parts kit and the remainder for a jug of carburetor cleaning solvent. Let's discuss this equipment, because you could easily end up with less-than-adequate stuff that will give you less-than-adequate results.

There are two types of parts (or rebuild) kits sold for every carburetor—a minor kit and a major kit. The minor kit contains needle(s) and seat(s), accelerator pump and gaskets. I suggest that you not buy this one, although it's about \$2 less in price.

The major carburetor overhaul kit contains all of the aforementioned parts, plus all others that you will need in order to do a *complete* carburetor overhaul. These additional parts include a fuel filter, idle



**REBUILD KIT** for major overhaul has everything from a manifold gasket to a rubber idle vent (above)



screws, main metering jet, idle vent and check valves.

Surprisingly, the work of replacing all of these parts is no greater than if you do the job with a minor kit. You have to tear down the carburetor thoroughly in both cases if you expect all parts to be thoroughly cleaned.

When you turn a carburetor over to a mechanic for overhaul, you're never sure whether you're going to get a "minor" or "major" rebuild.

By the way, the best place to buy a major carburetor rebuild kit is the parts department of a dealer who sells your make of car. Just make sure you get the parts kit for your model carburetor.

Carburetor cleaning solvent represents the major expense, because you get more than solvent if you buy a carburetor solvent kit, which you should. The solvent comes in one and five-gallon cans (one gallon is sufficient for your needs), but included in that can is a basket. As you take parts from the carburetor, place them in the basket, which is immersed into the solvent after tear-down is completed.

A solvent kit costs about \$9 in one-gallon size, but you can use it over and over for cleaning any metal parts on your car. The best place to buy it is from a local supplier of auto parts. Auto dealers' parts departments sell it, but usually in larger quantities.

You need one other piece of equipment for carburetor overhaul, and here's where you might hit a snag. After carburetor parts have soaked in solvent for a couple of hours and are then washed in water to remove solvent, they must be given a blast of compressed air inside and out. This is done primarily to remove specks of dirt loosened by the solvent that could be left in orifices and passages. Use of the compressed-air blast will also expedite drying.

Naturally, if you have a compressor, you have compressed air at hand. If you don't, I hope you're chummy with your local gas station operator. Ask



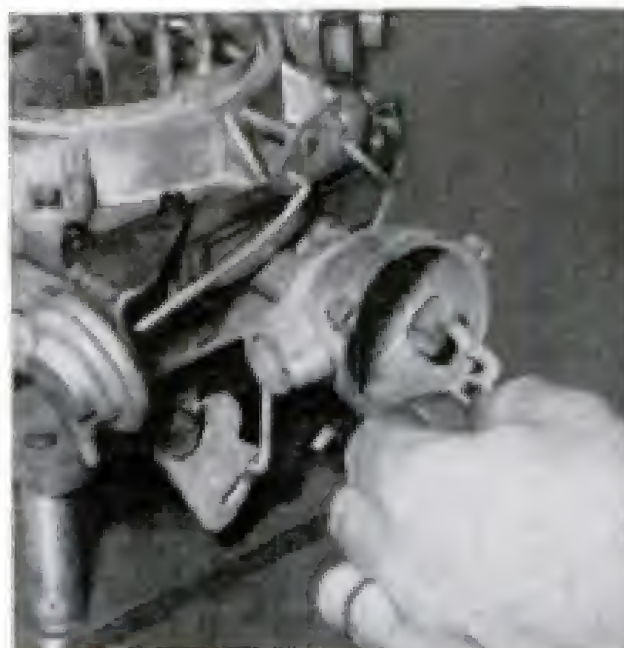
**TWO HALVES** of carburetor casting are separated for access to the internal parts. Note the four floats that are suspended from the top half



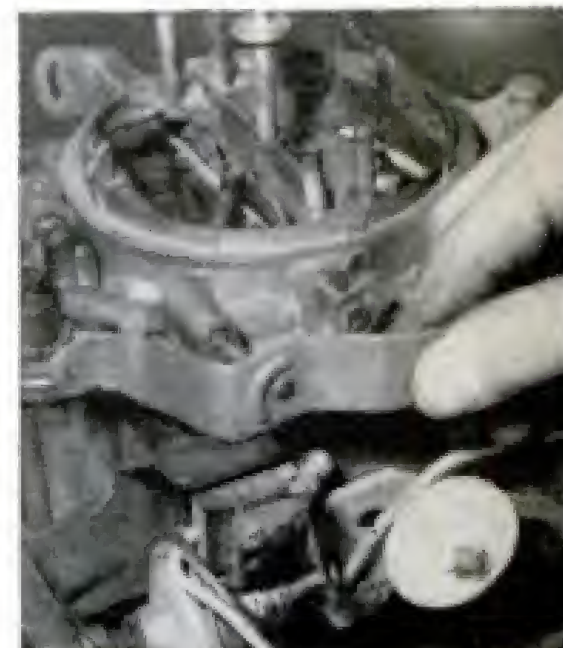
**TOP HALF** of carburetor body is inverted to reveal the accelerator pump. All rebuild kits contain a new pump, so discard old one when you remove it



**FUEL STRAINER** is removed and discarded; new one's in rebuild kit



**AUTOMATIC CHOKE** is removed for access to piston on this carb



**ACCELERATOR PUMP** lever is removed from the carb





**FLOAT ASSEMBLY** is removed and the needle valve (arrow pointing to tip) is replaced with a new one



**NEEDLE VALVE SEATS** are removed and discarded. Minor and major rebuild kits have new ones included



**VENTURI CLUSTER** is removed and main metering jet is unscrewed. Check for a new gasket in rebuild kit



**IDLE SCREWS** are removed and checked. If damaged, and rebuild kit has no replacements, buy separately

him to let you use his air setup—you'll tie it up only for two or three minutes.

Be careful how you handle carburetor parts in transporting them back and forth to the gas station. They could get dirt on them, so use a clean receptacle with a cover.

Another question that's probably on your mind is when or how often to overhaul a carburetor. This is not an easy question to answer, because the symptoms a dirty carburetor can exhibit are those that are created by faulty parts in other areas of the car.

However, once a carburetor reaches the 30,000-mile-mark in operation without its ever having been rebuilt, it's time to do an overhaul job. Let this be a hard-and-fast rule!

Suppose, though, that the engine suddenly becomes hard to start, begins to flood, starts to run or idle rough, begins to hesitate on acceleration, starts to eat gas, backfires, fouls sparkplugs or begins to stall. Each of these faults could be caused by a dirty carburetor or worn carburetor parts—or by other problems not related in any way to the carburetor.

You can handle the situation in one of two ways. First, you can plunge right ahead and do a carburetor overhaul, especially if dirt is visible in the carburetor throat or if it's actually leaking gasoline. If the car has been driven a considerable number of miles, an overhaul won't hurt and will probably do much good although it still might not clear up the problem. Or, you can do a tune-up and see if the condition disappears. If it doesn't, start the rebuilding.

Okay, let's get to work.

With the Rochester 4GC you can proceed as follows:

1. Unscrew the fuel line, choke tube and all vacuum hoses.
2. Disconnect solenoid connections, if there are any, and remove the throttle linkage from the throttle lever.
3. Unscrew the carburetor retaining nuts and lockwashers, and lift the carburetor mounting gasket. As with all other gaskets you take off, throw this away. You'll find that new ones are included in the rebuild kit.
4. Place the carburetor on a workbench and unscrew the idle vent. The small vent part itself is made of rubber, so push that piece out and place the idle vent metal



retainer in your cleaning basket. Discard the rubber part; a replacement should be in the rebuild kit.

**Caution:** Before discarding any part, such as the idle vent, *make sure* there's a replacement in the kit. Each kit varies as to the parts it contains, so it's wise to take an inventory of your kit before starting the job.

5. Remove the fuel strainer and throw it away—there's a new one in the kit.

6. Unscrew the choke cover, which contains the thermostatic spring. Do not put this plastic cover in the cleaning basket, but lay it aside.

7. Reach into the choke housing and unscrew the choke piston. Now, unscrew the choke housing.

8. Unscrew the accelerator-pump lever and remove the air cleaner stud by lifting it out—that's the part that holds the air cleaner.

9. Unscrew the air-horn retaining screws and separate the air horn from the bowl. Now, remove the accelerator pump. This is the part that provides the spurt of extra gas needed by an engine to compensate for sudden engine load changes. Throw this part away—there's a new one in your rebuild kit. Remove the accelerator-pump spring, which is also usually replaced.

10. Take off the float assembly and discard the needle. One and two-barrel carburetors have one float. Simple four-barrel

carburetors have two floats, but complex four-barrel carburetors, like this Rochester, have four.

Each float must go back into the carburetor in the same manner it was removed, so note positions. If a float is dented or you hear sloshing inside, indicating that the float is leaking, replace it with a new one. Do not put floats into the cleaning basket. Although metal, they are fragile and could be crushed by other heavier parts.

11. Unscrew seats and discard them.

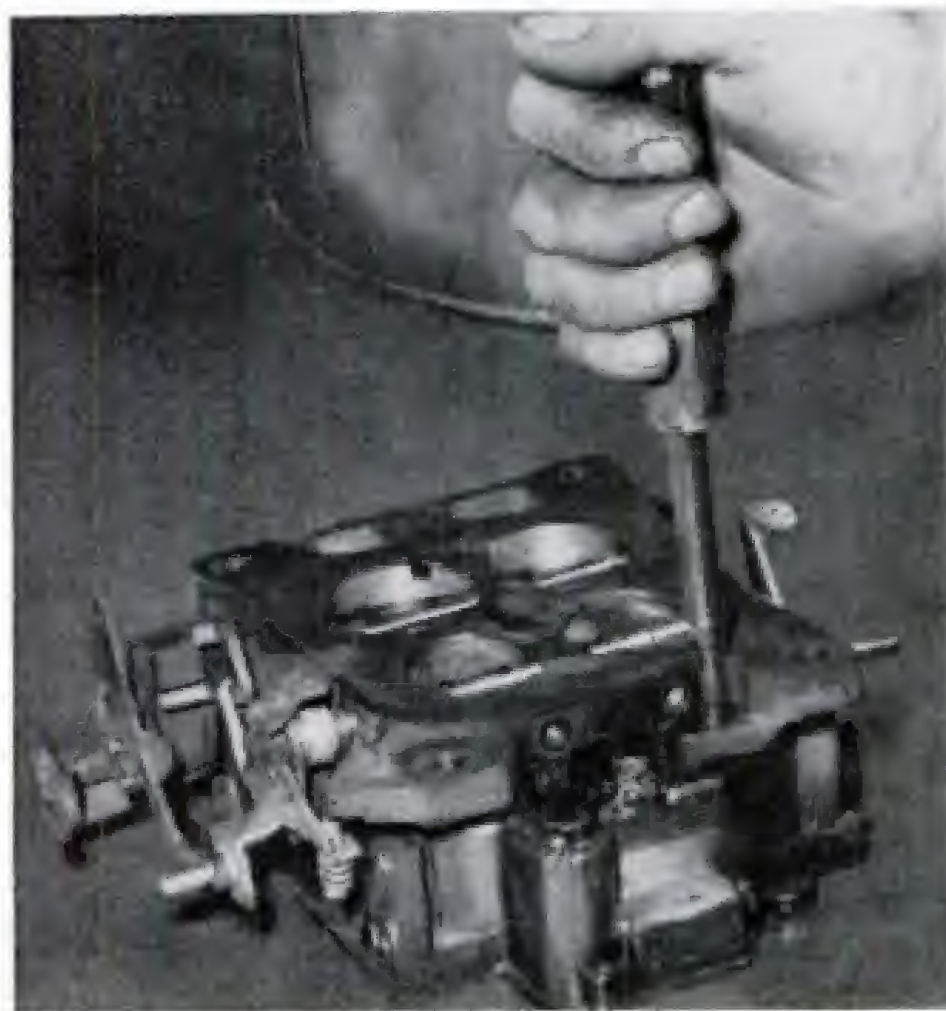
12. Remove the venturi clusters, which are held by screws, and remove their gas-kets. Unscrew the main metering jet. Some kits have new ones—others don't, so make sure before discarding.

13. Remove the idle mixture screws. Again, check your rebuild kit before discarding.

14. Finally, unscrew the carburetor base.

Now, let the parts soak in solvent for two hours or so. Then, wash each and dry them with compressed air before reassembling.

When the carburetor is reassembled, there are several adjustments that have to be made. Adjustments for simple carburetors are few in number. Those for four-barrel carburetors number as many as 12. Adjusting your newly rebuilt carburetor will be discussed in the *March Saturday Mechanic*. ★★★



**CARBURETOR BASE** is disassembled for access to the throttle valves. Keep sketch for reassembling parts



**BEST CLEANING** is by placing parts in solvent for couple of hours, then blasting with compressed air



# We Built This Tent Trailer

Using common tools, with an assist from my wife, I built this four-sleeper tent trailer in my garage

By JAMES L. BENNETT



**B**ECAUSE WE THINK CAMPING is the best and least expensive way to take vacations, my wife and I decided to put together this tent trailer.

With an 8½-foot trailer, we thought we could take our two children and dog on fun trips for less money.

So with my wife's help, I built our first tent trailer. It took me four weekends and it cost \$335.


I purchased the open A-frame chassis for \$145. You can build the whole tent

trailer for about \$250 if you make the chassis yourself. I decided to purchase the chassis because I am not that experienced in metalwork. But I do know woodworking.

I found that building the trailer box was simple once the plywood and lumber are cut to size. The plywood sections are so designed that you can use every bit of eight 4x8-ft. pieces of plywood. This means that you don't have extra bits and pieces left over after construction. It also



# for \$250



**TENT** unfolds easily at campsite. With one wing open (upper right), mattress straps are visible. Tent is up in center photo, and an optional canopy added in lower photo.

means that you will not have the expense of extra sheets of plywood.

To start, you need the trailer chassis. You can get this from a number of commercial metal works. Better still, you can scavenge it from an old beat-up trailer. Or you can build it from scratch—but you will need metalworking equipment. I purchased the frame from Stratford Fabricating Co.

Should you want to build the chassis, the materials you'll need include two

10½-foot sections of 2½-inch pipe. The trailer bed is 8 feet long, but you'll need an additional 2½ feet of length for the trailer tongue. Next, you need six 6½-foot pieces of angle-iron stringers. These must be welded to the piping. Suspension springs, brackets, axle and wheels come next. ([See diagram, page 167.](#)) Positioning of the axle is critical. You want the completed trailer to tow straight behind the car, and be so balanced that only 50 to 60 pounds of weight rests on the hitch. The







**BUILD CHASSIS**, then attach floor pieces. Trailer stands are attached to forward portion of chassis



**PLYWOOD FLOORING** is laid on joists. Attach floor and joists to angle iron with bolts or wood screws



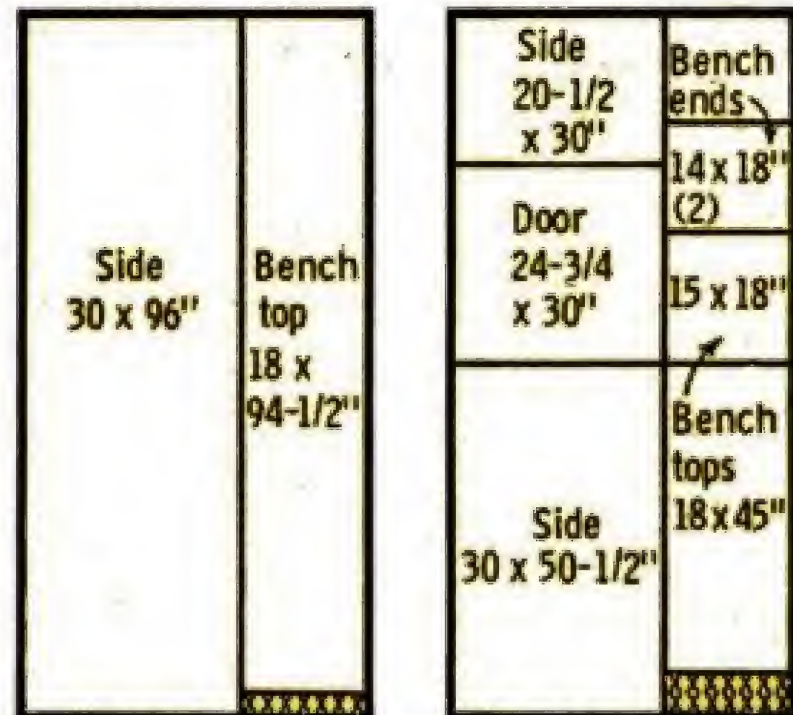
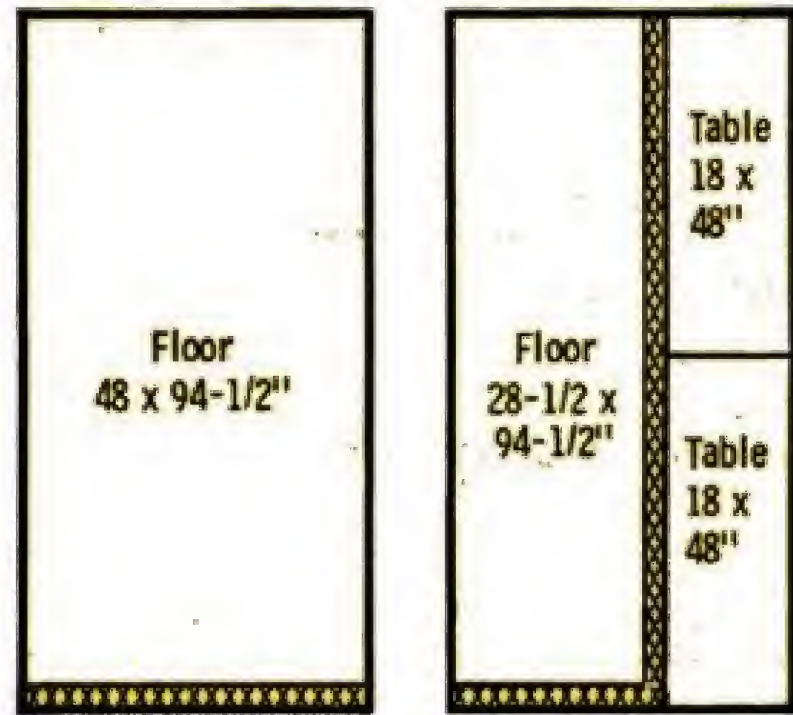
**PREFABING SIDES** is a good idea. Note position of the structural supports for cabinets at box ends

trailer tires should be 4.80/4.00 x 8-in., which are rated to carry 1200-pound loads at 60 mph. You want to try to keep away from large tires as they call for wheel wells in the camper box for wheel clearance.

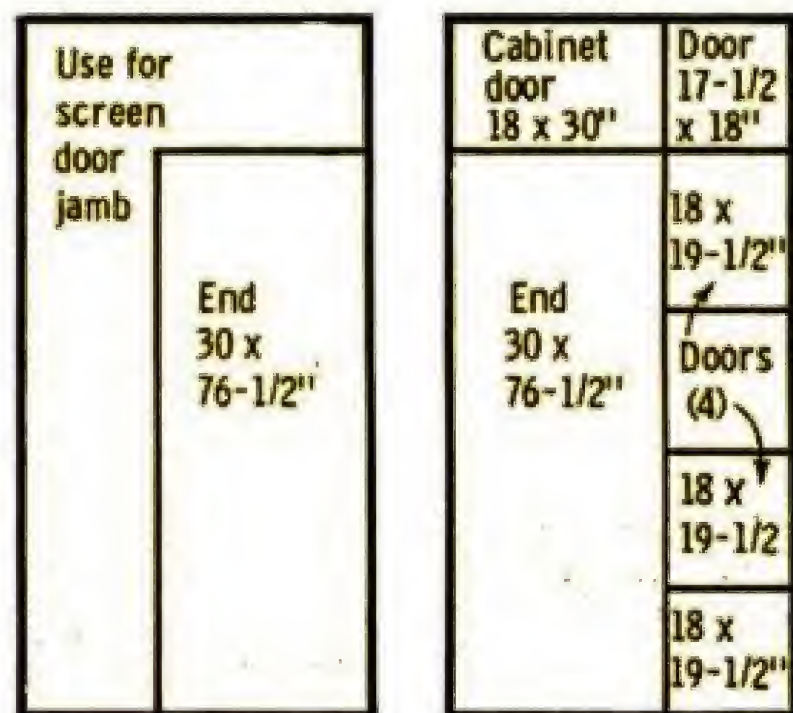
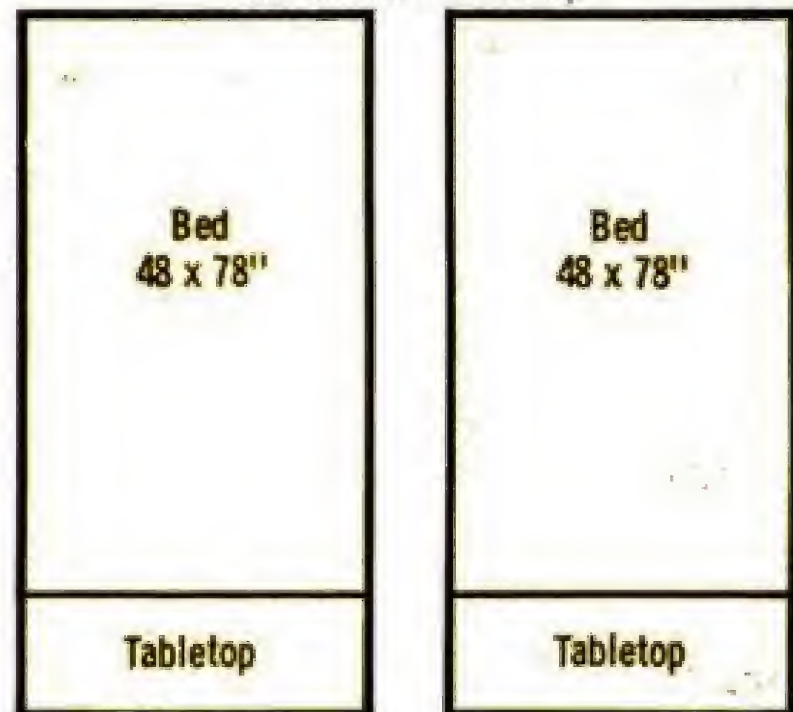
The trailer body is basically a box made of plywood with 2x4-in. lumber used as joists under the floor.

The floor should be of  $\frac{5}{8}$ -in. plywood,

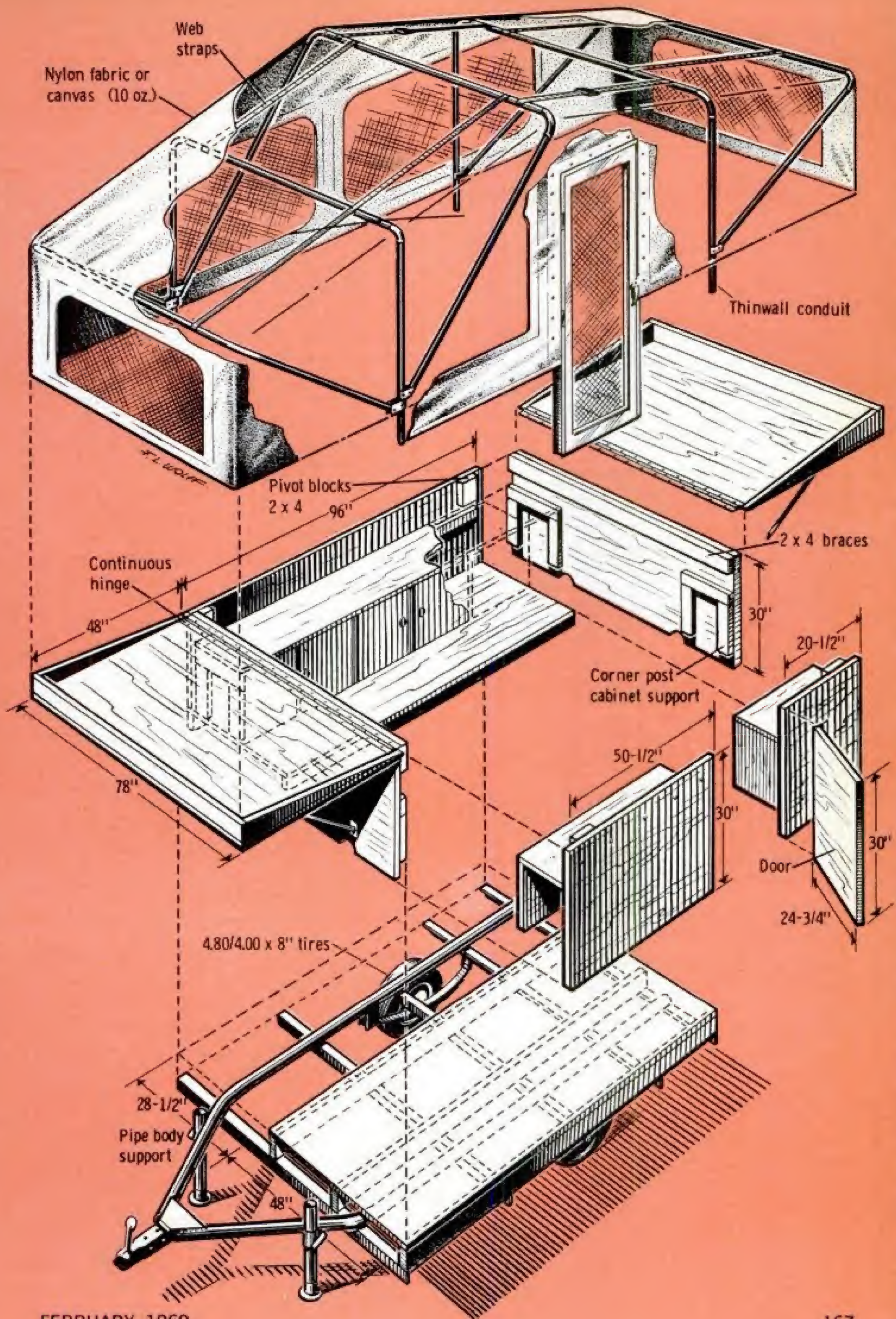
## PLYWOOD PATTERNS



xxxxxx denotes scrap











**SCREEN DOOR** can be mounted. This door is removed and laid on the floor when you collapse the trailer



**PIVOT BLOCKS** and bolts are necessary for tent pole. Note the steel straps used to attach oblique pole

while the trailer sides, top and cabinets can be of  $\frac{5}{8}$ -in. or  $\frac{1}{2}$ -in. Once you've cut all your wood, start by laying floors on joists and drilling through floor, joist and angle iron. Bolt together securely. Remember, this trailer will take a lot of bouncing.

To finish off the floor, it's a good idea to lay tile. Remember to arrange the tile so the joint between the two plywood floor sheets is covered. Also lay the tile before adding cabinets. This avoids intricate tile cutting and assures proper fit.

For the cabinets, use strips of 1x3-in. lumber as supports and lengths of 2x2-in. as structural supports in the corners and at the ends. Cabinet doors can be covered with vinyl to spruce up the trailer interior.

For extra sleeping space, make the table so the support leg can be folded under and the table can be detached from trailer bracket. Then lay the tabletop across the cabinet tops or benches. This can make up into another bed.

Here are some other trailer building tips:

Remember to keep the door handle low enough so there is enough space for collapsed tent poles and canvas.

Use heavy 2½-in. continuous piano-type hinges to secure bedwings to the trailer box.

Use awning brackets as sockets for bedwing support rods.

Use pivot blocks in corners so tent poles fall within the trailer box. Use pivot bolts to secure poles.

Cement sponge-rubber weatherstripping around the top edge of the trailer box. When the trailer is closed in the travel position, this stripping will absorb shock and help keep road dust out.

Paint the chassis so it will not rust and so it can be hosed off after long, muddy trips.

Now you're ready for the tough part—the tent canvas.

It is very possible that you may want some professional help on this important section. Few people have sewing machines capable of double stitching 10-oz. canvas. Rug-binding and hand awls may also present a problem to the average builder. A good awning and tentmaker can turn out a first-rate job for you when given the dimensions of your trailer. Remember, the tent poles, from pivot to peak, cannot be longer than the interior dimensions of the trailer box.

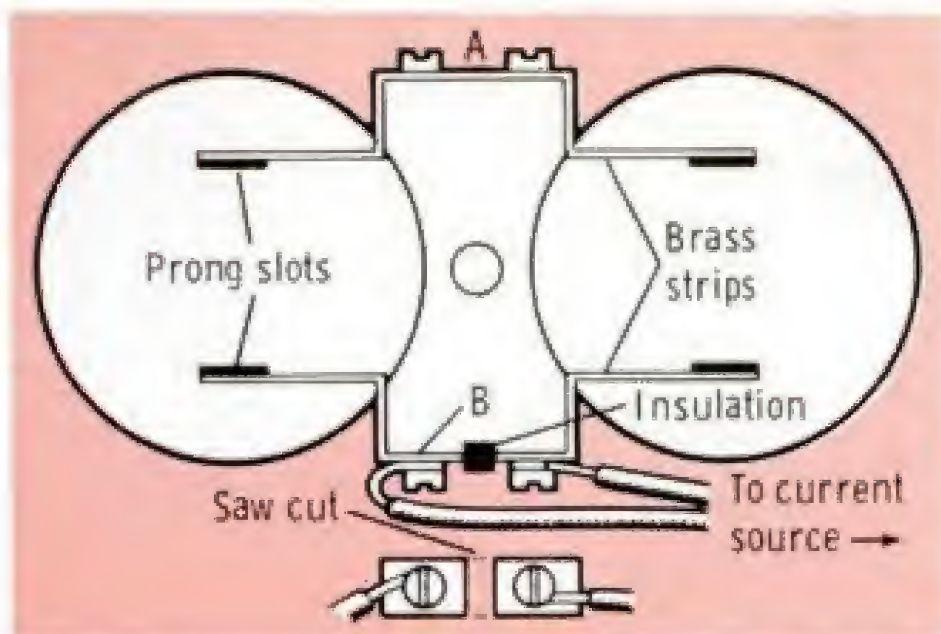
Electrician's thinwall conduit—about 9 cents a foot—can be used for tent poles and ribs. This material can be bent with a plumber's bending tool. Or you can have formed corners of  $\frac{13}{16}$ -in. bar inserted in saw-cut tubing ends. Wrap all joints with tape to prevent wear on canvas. Web luggage straps can serve to hold poles in the correct standing position.

There is a helpful source for those of you who might have trouble building the chassis and sewing the canvas. It's the Stratford Fabricating Co. in Bridgeport, Conn. This firm manufactures the open A-frame chassis and the tent. Prices run about \$145 for the chassis and \$146 for the tent.

★★★



# HINTS FROM READERS



## Circuit tester from duplex receptacle has own safety fuse

A simple change converts any electric receptacle in your workshop to a separately fused safety circuit.

To convert the receptacle you must wire the two pairs of outlet slots (normally connected in parallel) in series. With a hacksaw cut one of the brass strips between its two wire-holding screws. Make the slot as wide as possible, and fill it with insulating fiber. Apply insulating varnish

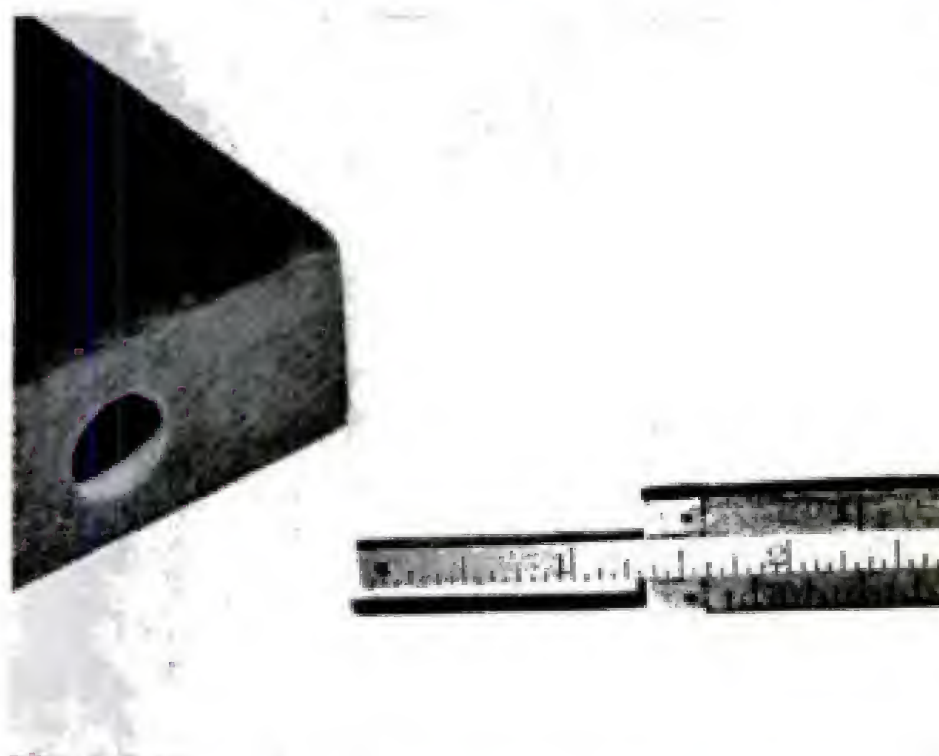


or shellac to this wedge. Now connect each wire of the current-supply cord to one of the two screws shown at B in the drawing. No connections are required at point A.

Mount the outlet in a standard box. Insert a lamp socket adapter into a receptacle and install a fuse of lower rating than the circuit fuse. Plug a suspected appliance in the other receptacle, and see if the fuse blows.—*Henry R. Rosenblatt*

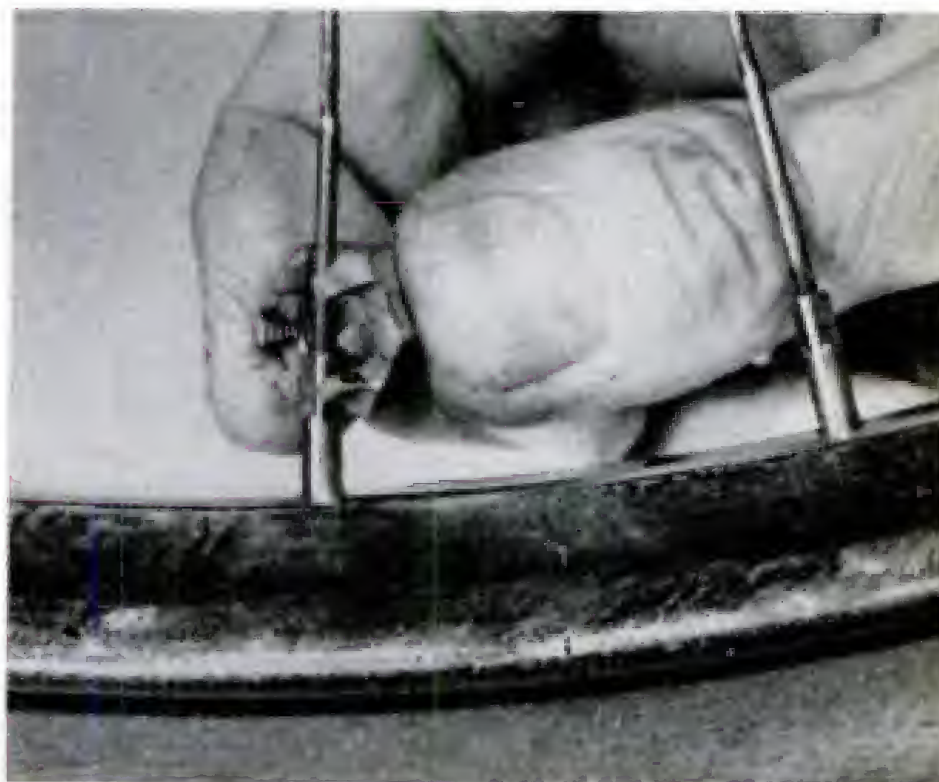
## Extension rule is handy depth gauge

When it comes to taking an inside measurement with a zigzag rule which has sliding extension, you already know how handy such a rule can be. But do you know that this same sliding brass extension can be handy too for checking the depth of dowel holes? Since the extension is narrower than the rule itself, the end of the rule provides a shoulder. Thus all you have to do is insert the extension in the hole and press forward until the rule touches the work.—*Richard K. Rogers*



## Improvised spoke tightener

A bicycle-spoke tightener is a tool you seldom need. Even if you have one, chances are you can't lay your hands on it right away. But when you need one, it's hard to find another tool that will do. Here's a perfect substitute you probably can find in your drawer of miscellaneous hardware: Select a castellated nut with slots that are  $\frac{1}{8}$  in. wide. You'll find the slots fit the spoke nipples perfectly, and you can easily tighten or loosen them with this makeshift wrench.—*Joe Dettling*



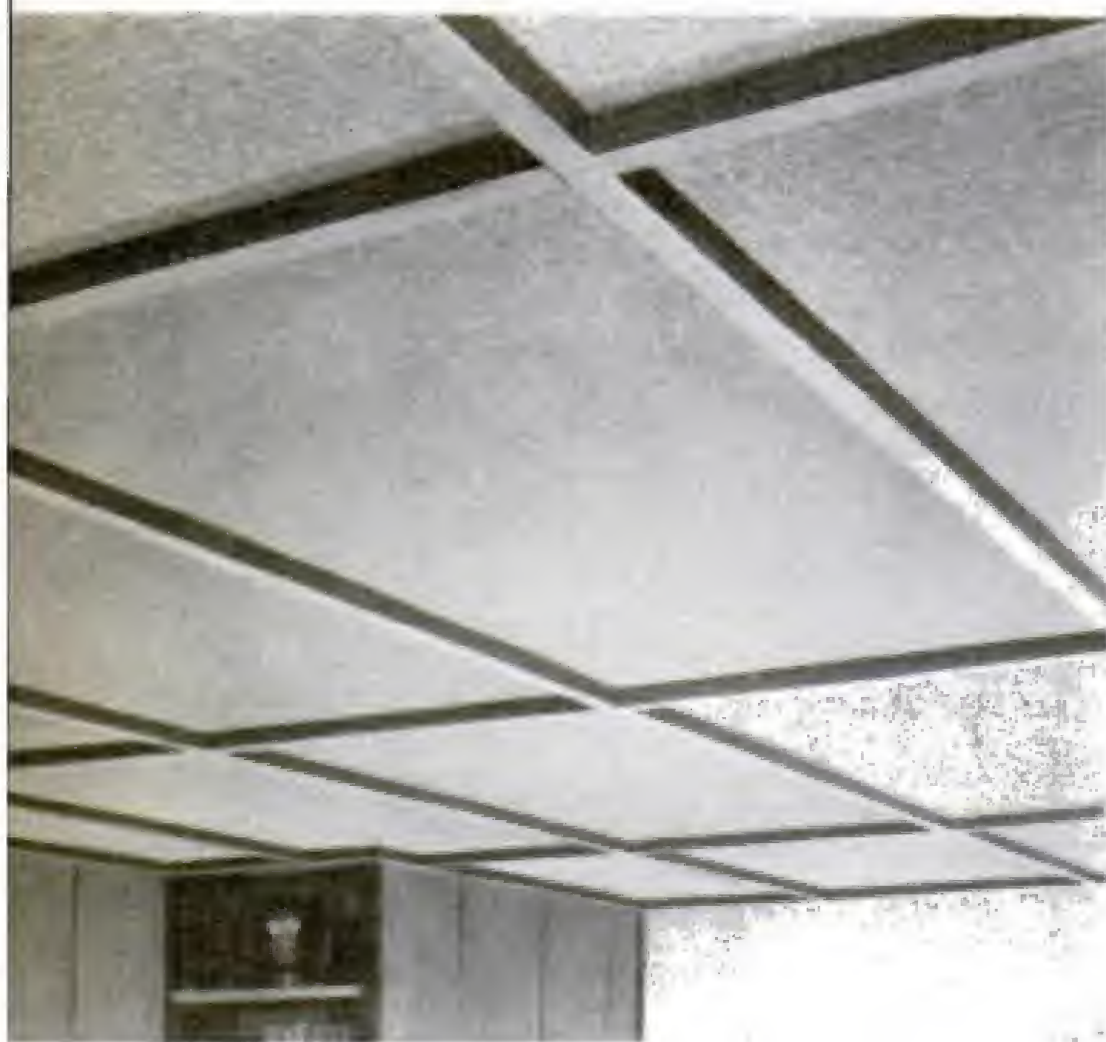


# EXCITING NEW PRODUCTS

By CATHERINE BILSKI

**TORCH-LITE GLASSES** have built-in, battery-powered lights that illuminate your work while leaving your hands free. Uses include emergency work in unlit basements and lighting awkward work areas. At retail outlets or for \$5.95 ppd. from C. & A. Imports, P.O. Box 87, Ocotillo, Calif. 92259.

**GRID RISERS** placed on top of the runners of an existing suspended ceiling recess the ceiling panels to give a framed effect (below). At lumber dealers and building supply stores, they sell for about 7 cents a lineal foot. The ceiling panels shown are named Sahara (also made by Armstrong Cork) and have a woven-grass-mat effect. Available for about 22 cents a square foot.



**PORTABLE REFRIGERATOR** (above) operates on car cigaret lighter or direct from 6, 12 or 24-v. battery. Called the Darwin Mark II, it comes complete with a 15-ft. lighter attachment cord. It sells for \$77 and is available from Darwin Industries, Inc., P.O. Box 745, Orange, Conn.



**HAGARON PEEL** is the solution to a complex of sticky problems such as dissolving pastes, gums and glues. It is odorless, colorless, non-toxic and nonvolatile. Priced at 49 cents (1 fluid ounce), it's sold at most stationery and retail outlets. In handy plastic squeeze container, it's distributed by Yasutomo & Co., 24 California St., San Francisco, Calif.





**HIGH-CAPACITY HUMIDIFIER** operates through forced-air furnace to add moisture to the air in a home. Heated air is bypassed to the unit, and a fan forces the humidified air through the duct system. Made by Quality Krafters, Inc., 700 W. Country Road B., St. Paul, Minn., Lake-Air unit retails for \$89.95.

**TAP-N-HOLD BRACKETS** eliminate need for conventional standards or wall strips when used with drywall or plywood paneling,  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$  or  $\frac{5}{8}$ -in. thick. They are quickly installed with just a hammer and without screws or toggle bolts. Available in 6, 8 or 10-in. lengths, the brackets sell for \$1.77 to \$2.33 per pair. Timber Engineering Co., 1619 Massachusetts Ave. N.W., Washington, D.C. 20036.

**ATTIC ROOF FAN** prevents excessive heat buildup under the roof and keeps lower and better balanced temperatures in living areas. Model RF-68 can be installed easily on a pitched or flat roof. Priced at \$99.95, it's made by NuTone, Madison and Red Bank Rds., Cincinnati, Ohio.



**ONE-COAT ANTIQUING KIT** now lets you prime, grain and seal in just one application. Covers practically any surface from furniture to walls and dries to a satin finish. Price is \$5.95 a pint and \$8.95 a quart at department and paint stores. Distributed by Krisler Corp., 60 Bowne St., Brooklyn, N.Y. 11231.





# NOW: Smaller Tractors That Shift for Themselves



Development of a smaller, low-cost unit now brings the convenience and efficiency of hydrostatic transmission to five new small-frame garden tractors

By JIM LISTON  
Executive Editor

**G**OOD NEWS for prospective buyers of '69 compact tractors is that four leading manufacturers—Bolens, Massey-Ferguson, Toro and Wheelhorse—have introduced seven-hp hydrostatic models for well under the \$1000 it had previously taken to eliminate clutching and shifting. Prices range from \$695 to \$800. The higher price includes a 36-inch mower, electric starting and headlights. The new sevens will be welcomed by many homeowners who didn't need the wheelbase and weight of a 10 or 12 hp for their two main jobs: mowing and snow removal.

The four new tractors have plenty of power for their big mowers. (We've tested all of them.) All four manufacturers offer snow-thruster attachments, and

one—Wheelhorse—has found its seven can handle an 8-inch plow for light garden work.

The new hydrostatic sevens resulted from the development by Eaton Yale & Towne of a simplified, compact hydrostatic transmission that can be coupled to a seven-hp engine. The new transmission offers all the advantages of the 12-hp "automatics": smooth speed changes from full forward to full reverse, perfect matching of speed to load, and elimination of clutching and throttle changing.

The transmission has three major parts: a variable displacement radial-piston pump; a fixed displacement ball piston motor, and a system of valves between the pump and motor. The pump

BALL PISTON



Combination of forces—the resultant of oil pressure on ball and off-center control ring—make pump

MOTOR



rotate. Pump converts mechanical energy (input) to pressure energy; reconverts it to mechanical (out-

OIL NOT  
UNDER  
PRESSURE

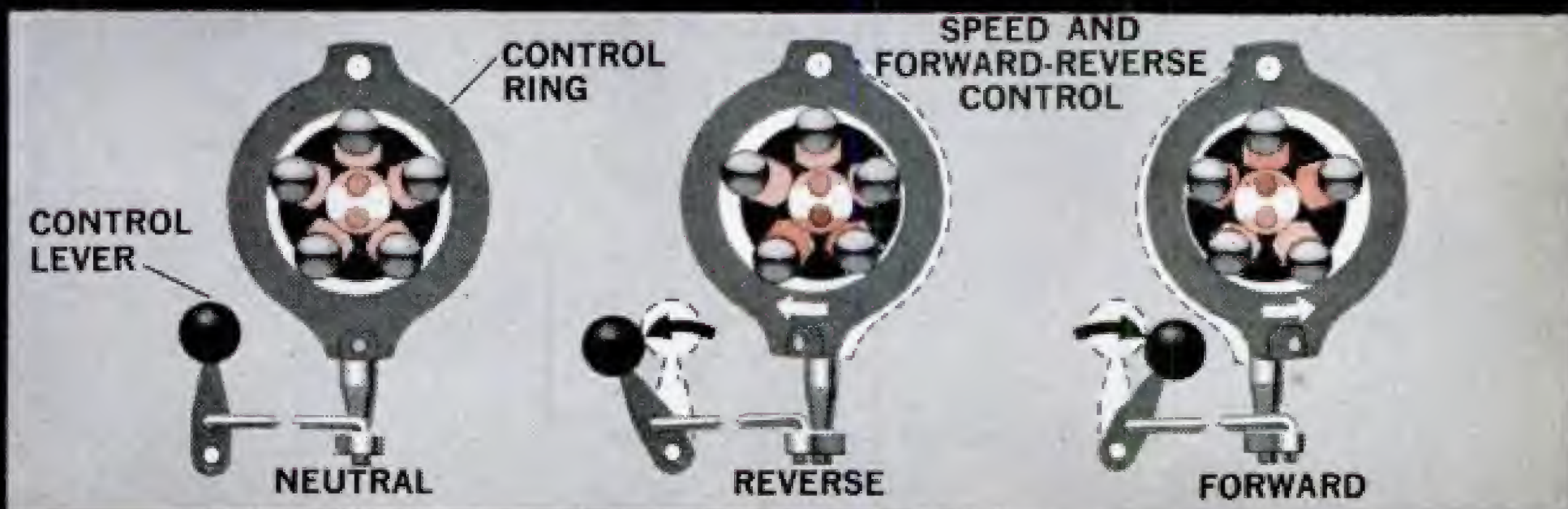
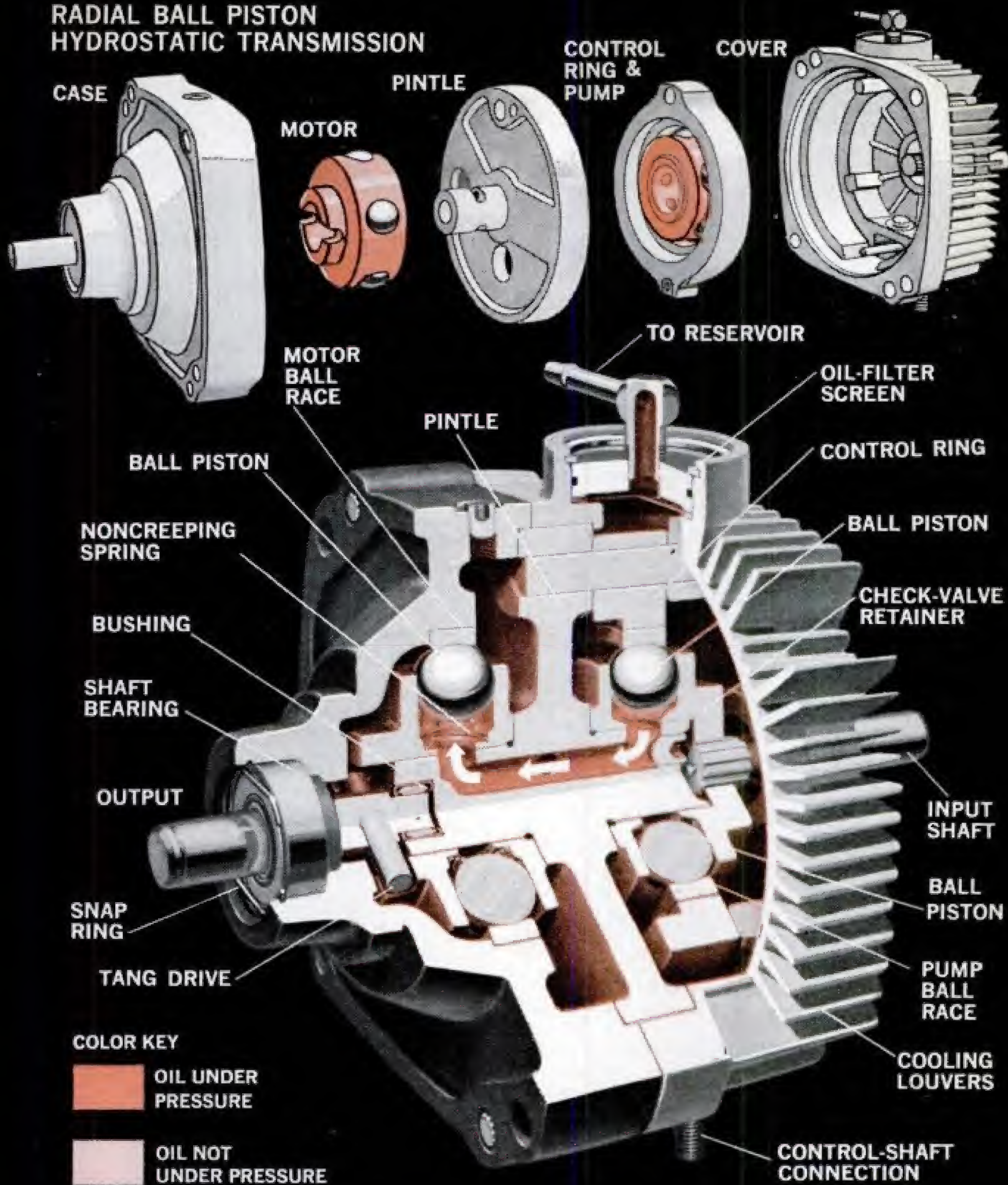
OIL UNDER  
PRESSURE



put). Conversion makes possible varied output torque, speed and direction with constant input.



# RADIAL BALL PISTON HYDROSTATIC TRANSMISSION



ART CREATED EXCLUSIVELY FOR POPULAR MECHANICS BY DALE GUSTAFSON





**WHEELHORSE CHARGER V7** (electric-starting standard) takes 36-inch mower, pulls 8-inch plow, costs \$780



**MASSEY-FERGUSON** costs \$695; with 34-inch mower, \$100 more. Electric starting is standard equipment

**TORO'S 25-INCH TURNING RADIUS** makes it highly maneuverable. The \$800 price includes as standard a 36-inch mower, headlights, electric starting



produces a flow of oil under pressure, through internal channeling, between pump and motor. The speed of the tractor is regulated by changing the amount of oil delivered by the pump. When the speed control is moved forward, the cam ring of the variable displacement pump is moved off center and oil flows through the circuit. Moving the lever varies the flow of oil—which varies the speed of the tractor. Since the circuit is a closed loop—and oil is relatively incompressible—whatever flow reaches the motor is transformed into speed, depending on volume and direction of flow. Maintenance is limited to checking the dipstick every 25 hours. ★ ★ ★

**BOLENS HUSKY 775** has foot-pedal control for hydrostatic: toe down for forward, heel down for reverse. Standard: electric starting, headlights at \$750





# HINTS FROM READERS

## Protection for new flooring

When nailing strips of tongue-and-groove flooring, protect them from denting hammer blows with this simple shield. It's just a 3 or 4-in.-long section of angle iron with one leg cut to the height of the tongue to the face. The center of this shortened leg then is notched for the nail. Even if you should miss the nailhead, the angle will absorb the force of the blow.



## Handy ink marker for crates

When filled with ink or paint, a spreader-type glue bottle will make it easy to address shipping crates or cartons. Just press the rubber cap of the bottle down against the crate so ink begins to flow, then draw the cap through the ink to form the necessary letters or numerals. Just be sure to apply only light pressure to avoid covering the surface of the crate with unsightly and unreadable blobs of ink. Show this trick to your children—it will help them make school posters.



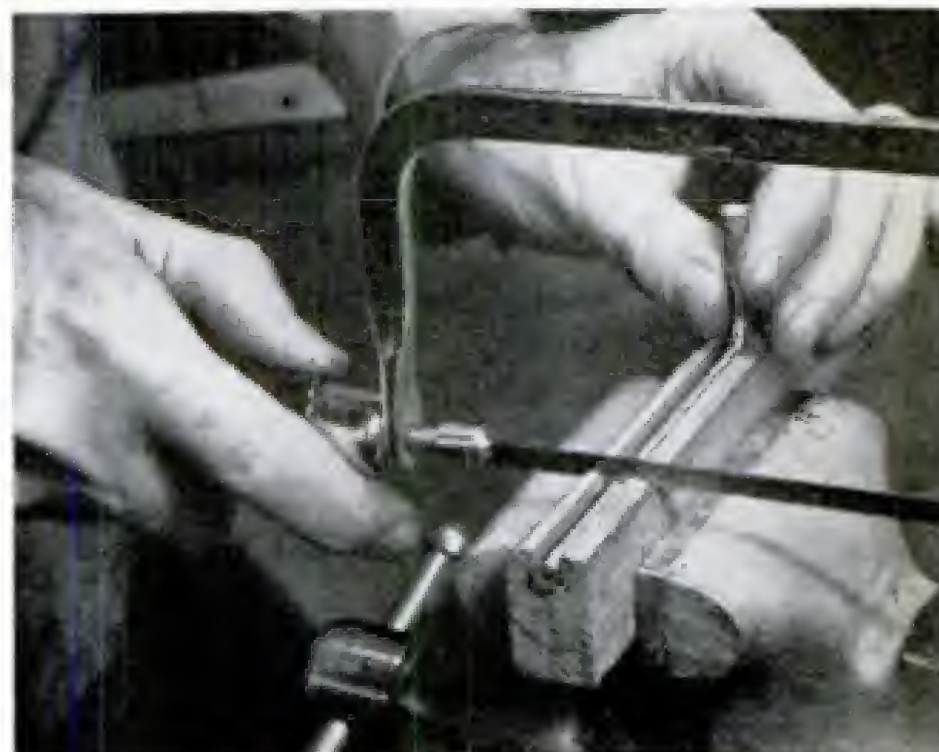
## Odd parts from ball pens

Old ballpoint pens can be made into useful items for your workshop supply. Remove the ink cartridge and all metal fittings, then slice the body, cap and even the ink cartridge into segments of assorted lengths. The result is a collection of plastic washers and spacers useful for building or repairing different projects. Some of the rings and spacers shown at the right were cut from the body or cap using the saw shown, while others were cut off on a lathe.—Walter E. Burton



## Cutting tubing neatly

To squarely cut sections of small-diameter tubes or thin, limber rods, clamp a suitable length of tongue-and-groove flooring in a bench vise so that the groove side faces upward. Cut a fine kerf across the lips of the groove, much like the slots in a miterbox. Then just position the tube or rod in the groove so the cutoff point is aligned with the fine kerf and saw through the work with a hacksaw. Supporting the work this way also prevents it from becoming marred in the vise jaws.





## WHAT YOU SHOULD KNOW ABOUT



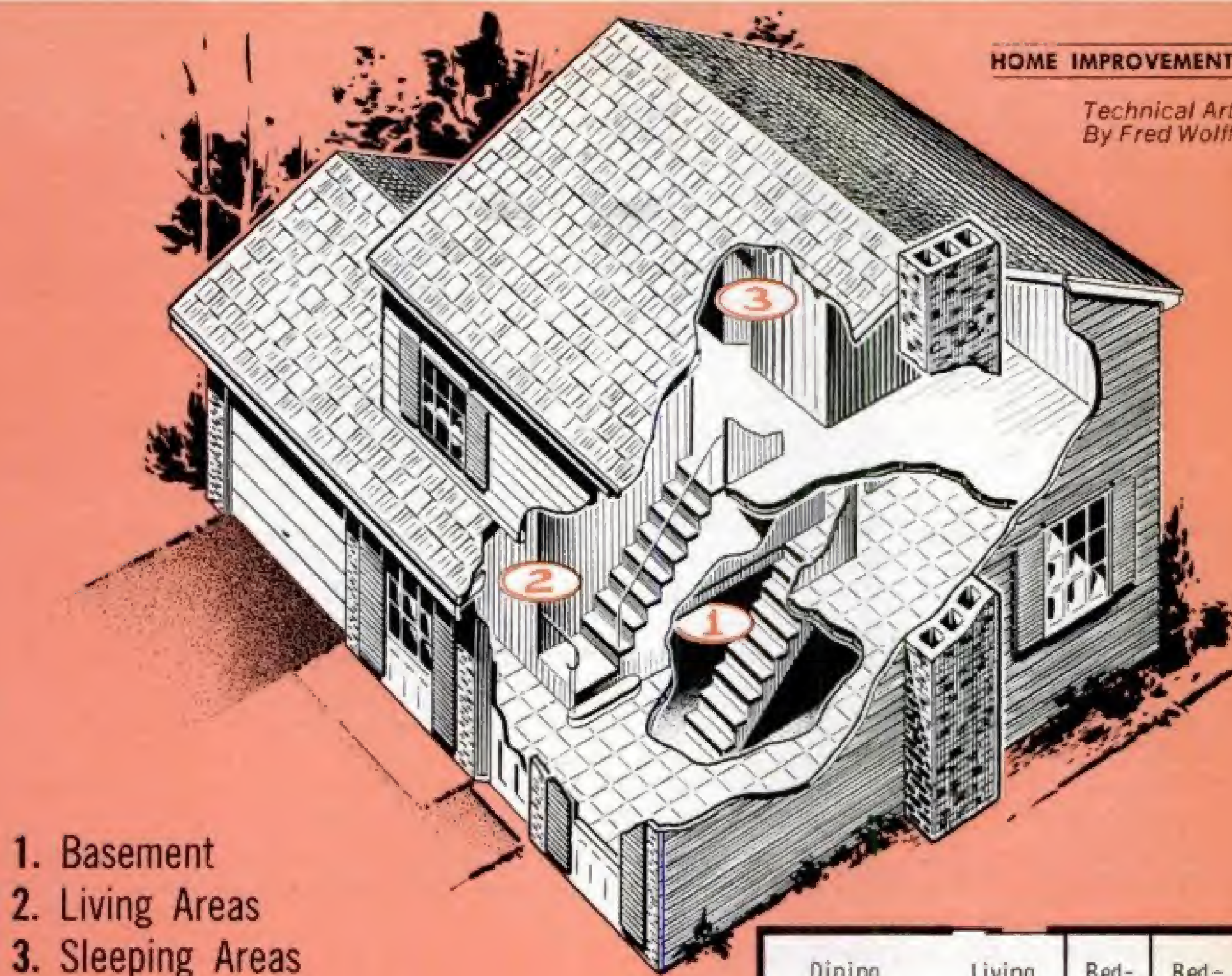
# FIRE WARNING SYSTEMS

**This single piece of equipment can protect more than your living-room furniture—it could one day save the lives of those in your family**

**By JAMES P. SCHENLEY**

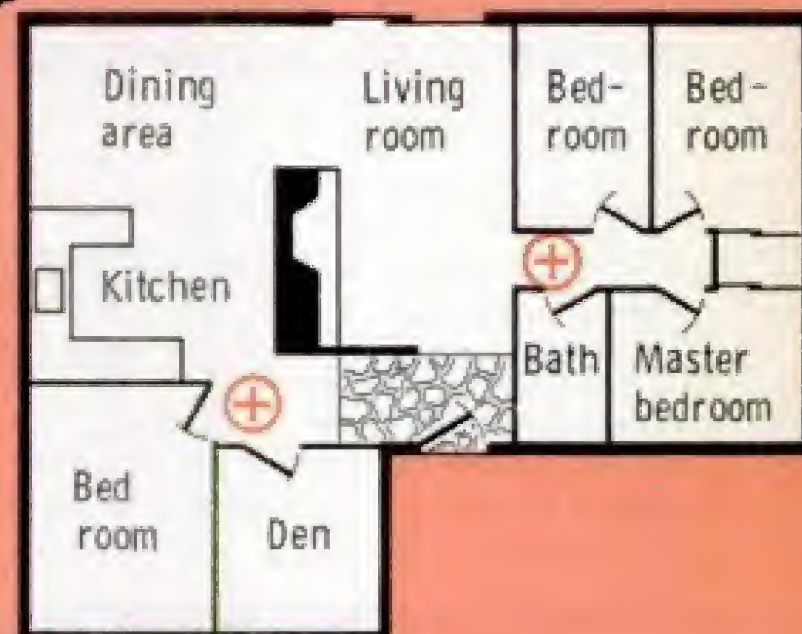
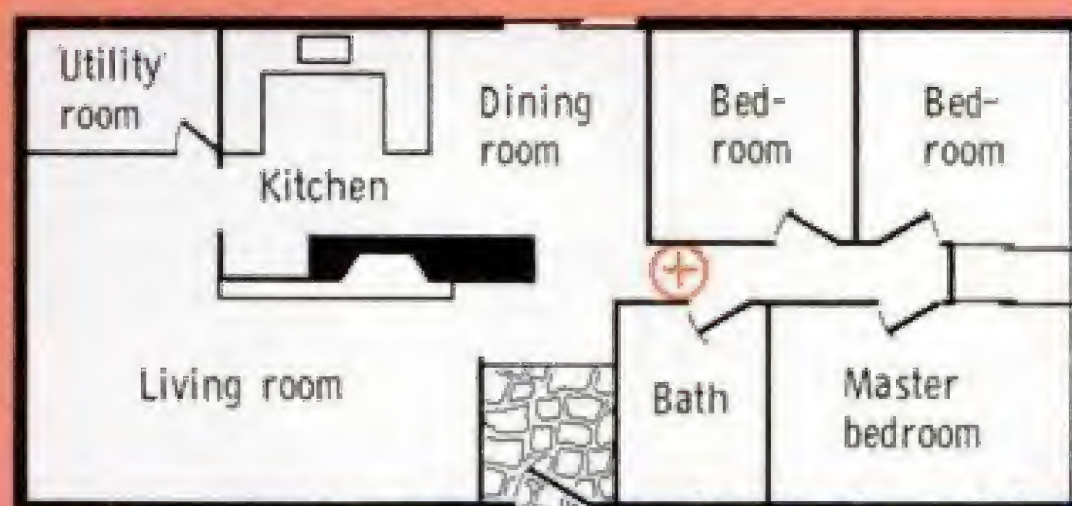


Technical Art  
By Fred Wolff



1. Basement
2. Living Areas
3. Sleeping Areas

IDEAL LOCATIONS FOR SMOKE AND FIRE DETECTORS are shown in cutaway. In plan below, bedrooms are protected



**MORE THAN ONE SLEEPING AREA** in a home calls for a minimum fire-protection arrangement that includes a separate detector for each area as indicated above

**WHAT REALLY CONSTITUTES** a reliable and adequate fire warning system for your home? Is it the can of compressed gas with a whistle that sells in hardware stores and supermarkets for \$3.95? Or is it a sensitive ionization system that costs \$1500 to install in a six-room house?

The fire-warning system for your home is probably neither, unless, of course, you can afford an ionization system. This system employs minute particles of radium to

detect a difference in air current—a difference created by a fire in its incipient stage when neither smoke nor flame is visible.

The right system, however, should detect both heat and visible smoke or, if this will strain your budget, at least detect smoke. Fire officials claim that approximately 75 percent of home fires begin as smoldering types that produce dense smoke in advance of flame. This smoke kills by asphyxiation, especially when the



victims are sleeping, unaware of their plight.

But before I describe the ideal and compromise systems, there is one most important fact to remember. Never buy detection equipment which doesn't carry the label of the Underwriters' Laboratories (UL) or the Factory Mutual Engineering Corp. (FM). This label is your assurance that the equipment has been thoroughly tested and will give dependable performance. In Canada, the label of Underwriters' Laboratories of Canada (ULC) provides the same assurance.

To help you find the system to meet your needs, a list of manufacturers is provided on page 179. Write to them for information, including price, before deciding which system you want. Ask them for names of their distributors in your area. Do not buy equipment from a door-to-door salesman, even though he may be selling UL or FM-tested devices. His price is usually inflated and he's not able to provide service if it's ever needed.

Warning devices for the home are smoke or heat detectors or both. Smoke detectors, other than the ionization system, use photoelectric cells to detect the products of combustion. Heat detectors sense abnormally high temperature or a rapid rate-of-temperature rise and usually are electrically or gas operated.

Each type must produce an alarm signal that can be heard throughout the

house. It must be rated at not less than 85 decibels at 10 ft. Each detector should also have a trouble signal to warn you of a failure in the system. This could be a different tone than that of the alarm signal, a light which flashes there's a failure or, in the case of a gas-operated heat detector, a sight glass.

A typical UL-listed smoke detector is a single-station device with a light-tight enclosure open to the atmosphere. (A "single station" assembly incorporates both the detector and the alarm sounding device into one unit.) A sharp beam of light is focused in the darkened enclosure of the smoke detector. Smoke particles entering the enclosure cause the beam to reflect light to a photoelectric cell, causing a decrease in the resistance of the cell. This sets off the alarm.

Although the primary purpose of a smoke detector is to detect smoke in advance of heat, many also contain a heat-detecting element which sets off the alarm if the ambient temperature in the vicinity of the detector reaches 135° F.

Installation of a single-station detector is easy. The unit is hung on a wall and plugged into a 115-v.a.c. outlet. The top should not be less than 6 nor more than 12 inches from the ceiling. Also, it should not be placed in a corner.

Heat detectors will switch on the alarm when exposed to a fire producing heat but

**CHECK FIRE WARNING SYSTEMS REGULARLY.** Smoke detectors, such as the one below, can be checked simply by blowing cigaret smoke into grille. Gas-operated heat detectors, such as that shown on the right, incorporate a sight glass to check gas level





little smoke. Electrically operated heat detectors have a thermostat that makes or breaks an electrical circuit to set off the warning alarm. Although electric systems are plugged into 115-v.a.c. outlets, they then transform and rectify the a.c. to not more than 30 v.d.c.

An electrical heat-detection system must be equipped with a reserve power supply of batteries in the event of a power failure. The batteries present a maintenance task since they should be checked or recharged yearly.

An electrically operated system should also have a means to test the system (usually a switch). The average cost of such a heat-detection system for a typical house is about \$750.

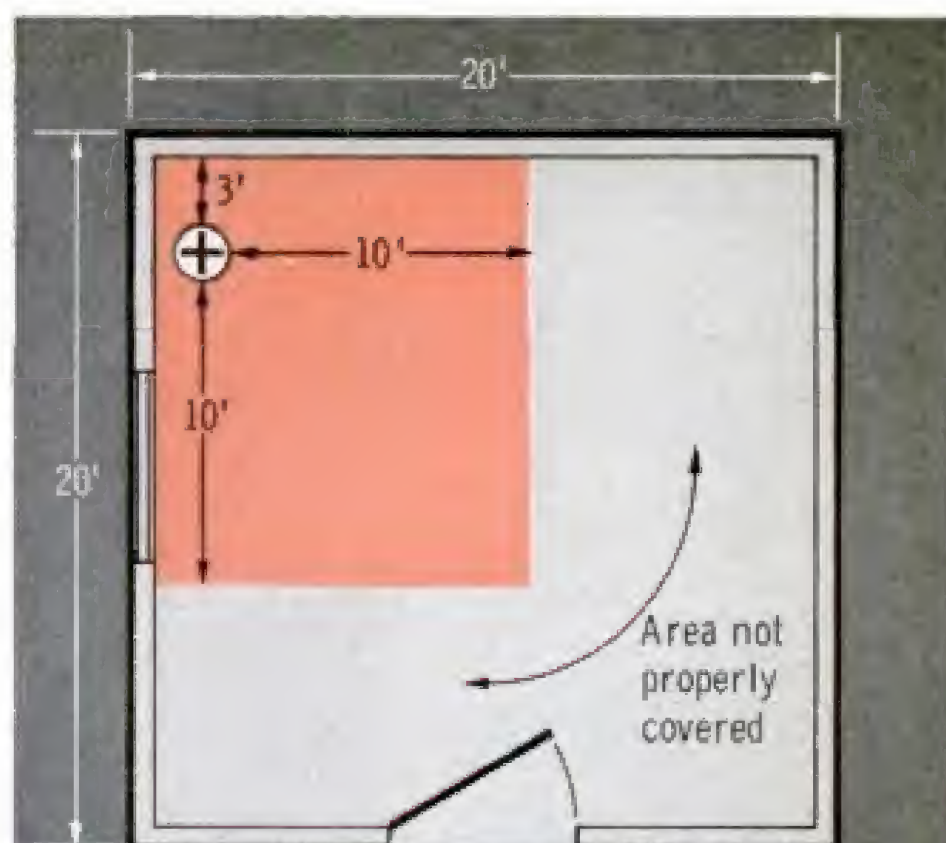
**Gas-operated heat detectors** are normally single-station devices that sell for about \$45 each. You can install these yourself, since all you do is screw a bracket into place to hold the unit.

The gas unit is a cylinder of Freon with a heat-sensing element. As temperature rises, gas pressure builds up until a valve opens to let the Freon pass to the alarm. Units for living quarters are set to go off at 136° F. while units rated at 174° F. are for attics or near a furnace.

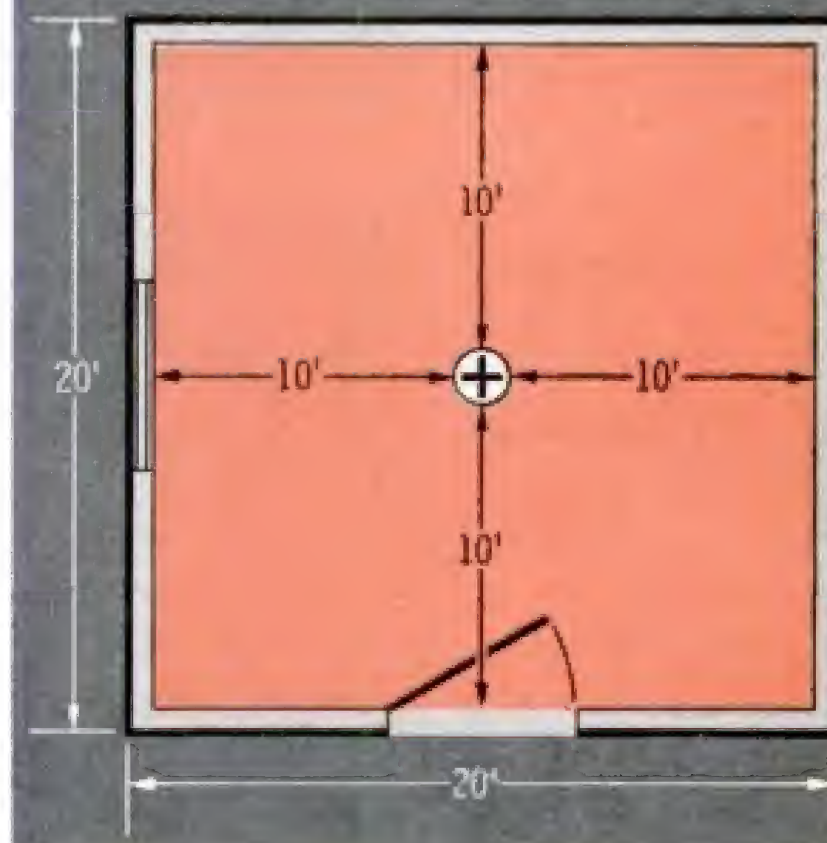
In an average house, heat detectors

## LIST OF MANUFACTURERS

- Alarm Device Mfg. Co., 100 Voice Rd., Carle Place, N.Y. 11514.  
 Bliss-Gamewell, 209 W. Central St., Natick, Mass. 01760.  
 BRK Electronics, Skokie, Ill. 60076.  
 Casady Engineering Associates, 13626 S. Normandie Ave., Gardena, Calif. 92047.  
 Chicago Fire & Burglar Detection, 646 Roosevelt Ave., Glen Ellyn, Ill. 60137.  
 S. H. Couch, Inc., 3 Arlington St., North Quincy, Mass. 02171.  
 Dictograph Security Systems, 733 Mountain Ave., Springfield, N.J. 07081.  
 Edwards Co., Inc., Norwalk, Conn. 06854.  
 Electronic Locator Corp., 343 W. 37th St., New York, N.Y. 10018.  
 Emerson Electric, 8100 Florissant, St. Louis, Mo. 63136.  
 Evergard Fire Alarm Co., Inc., 601 W. Susquehanna Ave., Philadelphia, Pa. 19122.  
 Falcon Alarm Co., 20 Stern Ave., Springfield, N.J. 07081.  
 Faraday Div., Gray Mfg. Co., Tecumseh, Mich. 49286.  
 Fenwal, Inc., Ashland, Mass. 01721.  
 Fire Alert Co., 505 W. 40th Ave., Denver, Colo. 80216.  
 Fire Control Co., 703 Thorton St., Wilmington, Del. 19801.  
 Fire Device Co., 414 Rolyn Pl., Arcadia, Calif. 91006.  
 Fire-Lite Alarms, Inc., 190 Fulton Terrace, New Haven, Conn. 06502.  
 FSI Security Systems, 223 Arch St., Philadelphia, Pa. 19106.  
 Honeywell, Inc., 2701 Fourth Ave. S., Minneapolis, Minn. 55408.  
 Interstate Engineering Corp., 522 E. Vermont Ave., Anaheim, Calif. 92805.  
 Walter Kidde & Co., Inc., Belleville, N.J. 07109.  
 Notifier Corp., 3700 N. 56th St., Lincoln, Neb. 68501.  
 NuTone, Inc., Madison and Red Bank Rds., Cincinnati, Ohio 45227.  
 Protectowire Co., Hanover, Mass. 02339.  
 Pyrotec, Inc., 349 Lincoln St., Hingham, Mass. 02043.  
 Pyrotronics, Inc., 2343 Morris Ave., Union, N.J. 07083.  
 Signals Systems, Inc., 650 Arch St., New Britain, Conn. 06051.



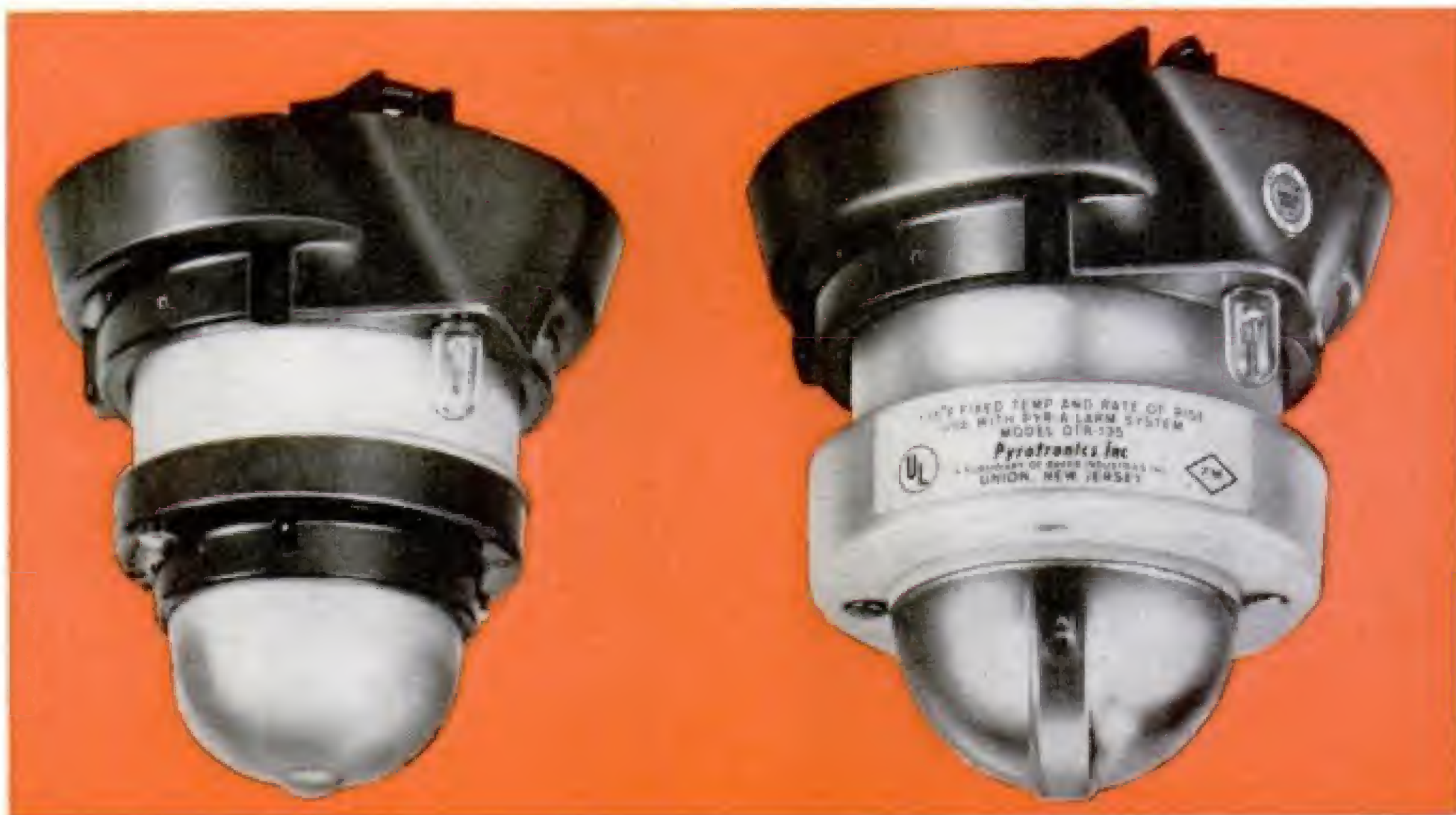
**AN IMPROPERLY LOCATED DETECTOR** is hardly better than none at all. As shown above, a detector with a sensing distance of 10 ft., for example, will cover only a portion of a 20x20-ft. room when placed in a corner. Placed in the center of the room, however, it covers the full area (below)



**IONIZATION DETECTOR** sets off alarm in initial stage of fire, even though no smoke or fire is visible







**ELECTRICALLY OPERATED HEAT DETECTORS** may be activated by temperature increase or rapid rate of temperature increase. The latter type (above, left) signals when the room temperature rises 15° F. per minute



**LATEST INNOVATION** in home security systems is a combined fire-burglar alarm. Such systems package 135° F. heat detectors, door and window switches, plus different sirens or horns as signals. Smoke detector is shown above and control panel below



should be hung in the basement (on the underside of joists—not between them); on the basement side of the door leading to the living quarters; in the kitchen, living and dining areas, halls outside bedrooms, garage and in the attic.

Since gas units can't be tested without ruining them, an important part is a sight glass that allows you to see the level of the Freon. If the cylinder leaks, the unit should be replaced.

Both electric and gas-operated heat detectors are rated according to the distance (D) they cover—measured from the detector to the side of the largest square that can be effectively sampled by the detector. Distances covered vary from 5 to 25 ft.—thus, it's important to know the distance rating of a unit to position it properly.

For example, a single detector with a D of 10 ft. mounted on a smooth ceiling in the middle of a 20x20-ft. room will cover the entire room. However, if the detector is moved to a point near the wall, the coverage is reduced to approximately 10x13 ft. Thus, more than one detector would be needed in this room for full coverage.

If you're now thinking about installing a fire warning system in your home, I suggest you read "Household Fire Warning Systems." You can get this free pamphlet (NFPA No. 74) by writing the National Fire Protection Assn., 60 Batterymarch St., Boston, Mass. 02110. ★★★





# All-Purpose Alarm You Can Build From a Kit

This versatile new Heathkit home-protection system can sense smoke, fire, burglars, a flood in your basement, even a freezing water pipe. Its warning signals are transmitted through your house wiring

By **SHELDON M. GALLAGER**

*Photos by Robert D. Borst*

**Y**OU CAN WIRE this new electronic alarm to warn yourself of just about anything that can happen around a home. In addition to providing fire protection, it will sound an alert if your cellar starts to flood, your food freezer goes off, or a prowler tries to break in. Designed to be fail-safe, it will also squawk if the power goes off or if one of its own components starts to act up.

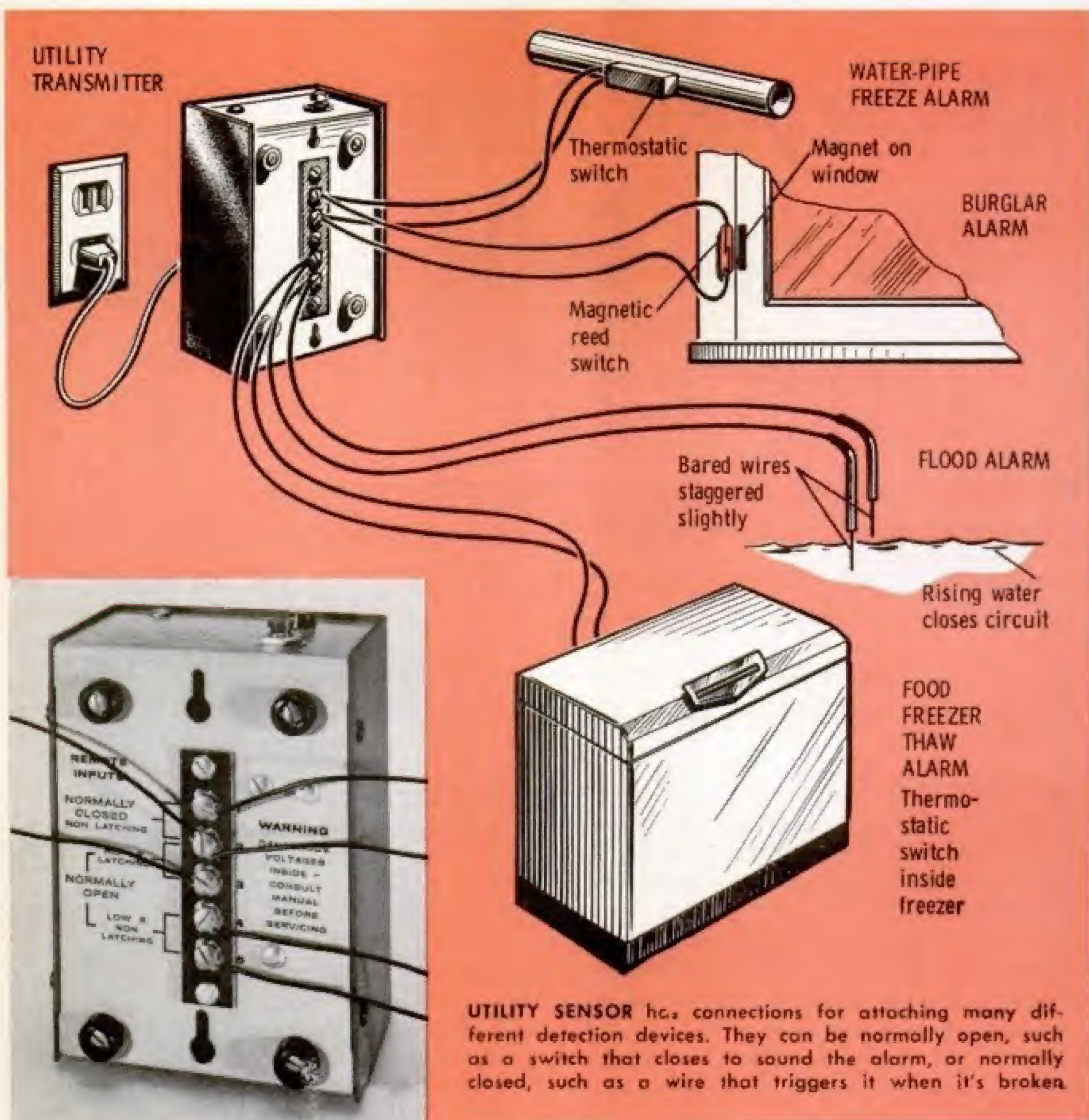
Made by Heath, the ingenious system is sold in kit form and you put the parts together yourself. There are three basic units—a smoke-heat sensor to detect fire, a general-purpose utility sensor that can be wired to a variety of detection devices (such as basement flood detectors), and a remote alarm station that sounds a warning if any of the

**ALARM SYSTEM** requires no wires between units. You merely plug them into wall outlets and signals are transmitted anywhere in the house over existing wiring. Three basic units are attractive tabletop alarm station (upper left), smoke-heat detector (above) and multi-purpose detector (below)

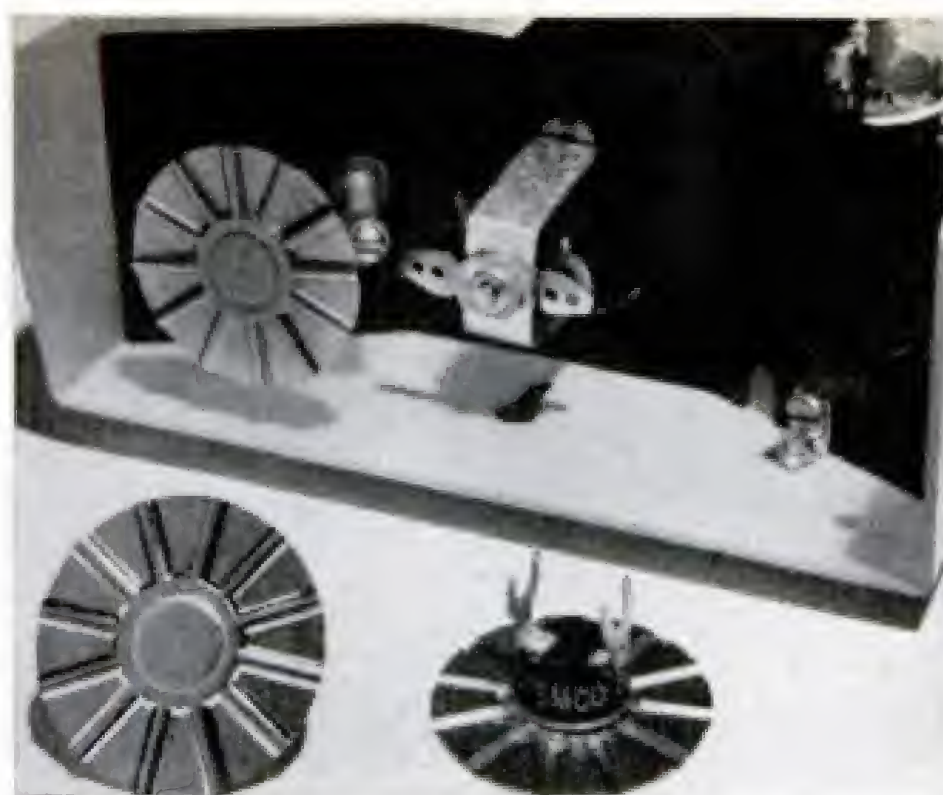




**ALARM UNIT** is easy to assemble because main wiring is all done on a predrilled and labeled printed-circuit board, shown at near right. You just insert the leads through the holes and solder them to foil backing on the opposite side. Large round object at far right is the audible alarm sounder that gives out a loud, high-pitched screech when one of remote sensors is tripped.







**FIRE-WARNING UNIT** contains a small, round heat sensor that sounds alarm if temperature goes above about 133° F. Extra sensors (shown in foreground) can be wired in series with the one in the unit to give you additional protection in other locations

sensors are triggered. There aren't any wires to string between the units. You just plug each one into the nearest wall outlet. The two sensing units are actually small transmitters. When triggered, they send out a 50-kHz signal over the house wiring to the alarm unit. The alarm picks up the signal and sounds a high-pitched warning screech.

You can place the sensing units anywhere you want—down in the basement, up in the attic, out in the garage, and so on. The alarm, a trim-looking little unit resembling a small radio, can be kept on a bedside table or bookshelf. Any number of sensor units can be combined with any number of alarm units. For the average-size house, one alarm is probably sufficient since the warning squawk is loud enough to be heard for some distance.

The advantage of this remote-controlled system over the single-unit, self-contained type is that the alarm sounds not where the fire is, but where *you* are. This is important if you're asleep at one end of the house and a fire breaks out at the other end.

Should the power go off or the alarm become accidentally disconnected, batteries automatically take over to sound a warning. In addition to the built-in squawker, there's also an outlet for connecting an external bell, buzzer, siren, light or other remote warning device.

The fire-warning unit incorporates two separate sensors—one for smoke and one for heat. This way, a smoldering fire that gives off smoke without much heat will

trigger the alarm through the smoke detector before it gets big enough to set off the heat sensor. If the temperature goes above about 133° F., the alarm will sound whether there's any smoke or not.

The smoke detector represents a bit of electronic ingenuity. There's a tiny light bulb shining into a dark chamber, with a light-dependent resistor off to one side out of the way of the beam. So long as the chamber is clear, no light reaches the resistor and its resistance remains high. When smoke trickles into the chamber, it reflects some of the light onto the resistor. The resistance drops, passing current to a transmitter that sends out the warning.

Handiest unit in the system is the utility sensor. It can be wired to send out a signal from various homemade sensors as well as from many commercial devices. A couple of bare wires will function as a simple flood detector, as shown in the accompanying drawing. Thermostatic switches available from heating and refrigeration dealers can be hooked up to warn you if a pipe is in danger of freezing or your food freezer starts to thaw. Different types of pressure and magnetic switches can be rigged to set off the alarm if a door or window is opened.

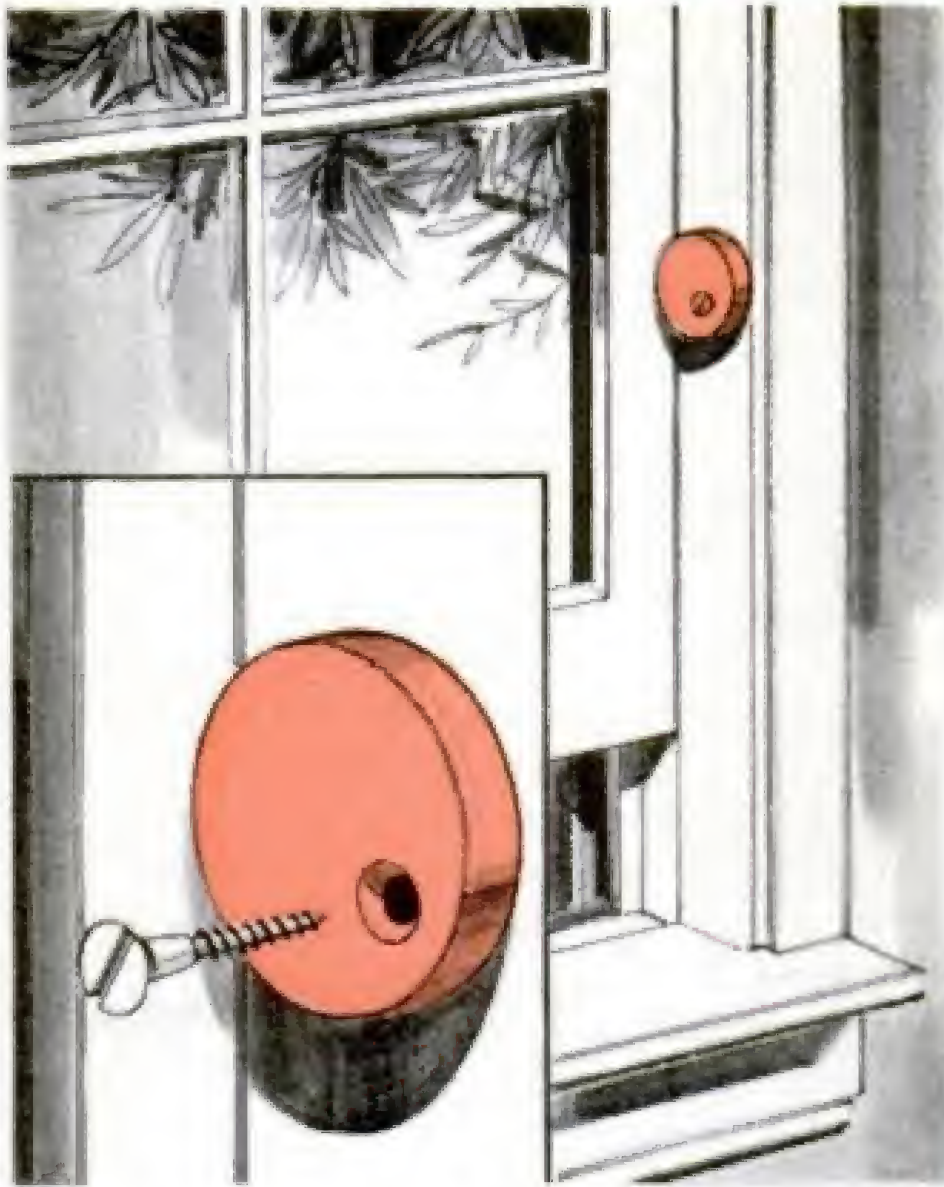
The units will send and receive over a considerable distance—even between two houses if there's no line transformer in the way. This raises the interesting possibility that your next-door neighbor might "house sit" for you when you're away. You'd simply give him your alarm unit to keep for you, and anything that triggered a sensor in your house would automatically sound the alarm in his house.

In the present version, there's no way of telling just which sensor has set off the alarm—you have to make a fast check to determine the cause. Heath is exploring the possibility of devising a system that would pinpoint the source of the trouble—such as fire, flood, intruders—but this would raise the cost.

The three units are available separately. Prices are \$39.95 for the alarm kit, \$49.95 for the fire detector kit, and \$34.95 for the utility sensor kit. The kits are relatively simple and can be put together in a few hours. Included with the assembly instructions are suggestions for various sensors you can make yourself. The Heathkit system is sold by Heath Co., Benton Harbor, Mich. 49022. ★ ★ ★



# Solving home problems



**LOCKING CAM FOR WINDOWS** will allow you to raise a window as much as necessary, without risking its slamming shut accidentally. As shown in the detail, the cam is a simple wooden disc that's drilled off-center



**AN IRONING BOARD** can serve as a convalescent's tray and make him more comfortable while he's fighting the flu. The board is easy to move as necessary and will also act as a reading table or a hobby bench



**SELDOM-USED, BUT OFTEN MISLAID, KEYS** can be kept handy by screwing ordinary cup hooks into the inner face of a drawer. Slip the keys over the hooks and you'll no longer spend hours searching for one key



**DRAWERS WITHOUT STOPS** can be fitted with this type of pivoting drawer stop, yet removed when necessary. Simply remove the drawer, install the stop, flip it down and reinstall drawer. Then flip the stop up





**IN AN EMERGENCY**, a small oil can may easily be converted into an alcohol lamp. Clean the can and fill with alcohol. Then enlarge the opening of the tip and feed through a long cotton cord to act as the wick

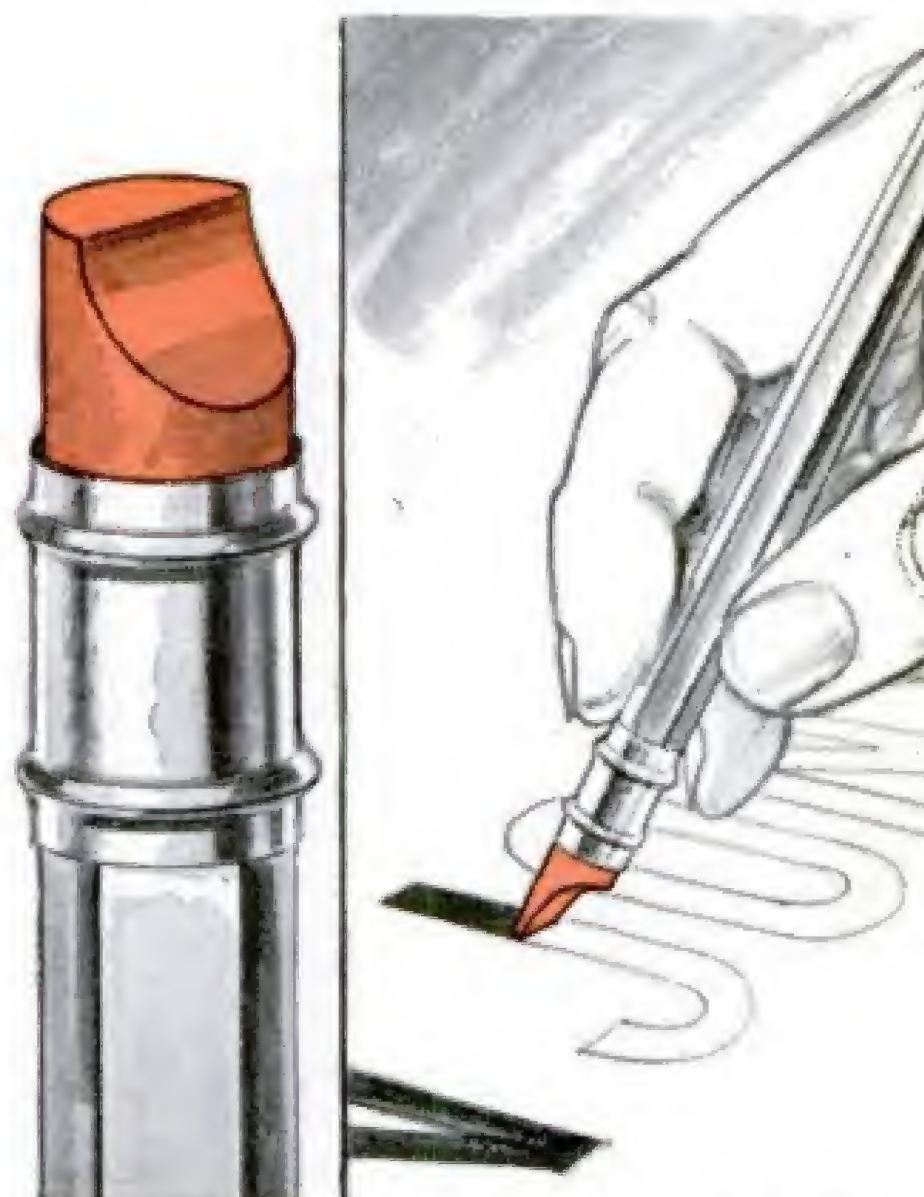


**TACK A TIN STRIP** around the top of a tree stump and you have a convenient planter for vines that will hide the stump. In only a few years, the hidden stump will rot and then be much easier to remove

FEBRUARY 1969



**MAKE YOUR WIFE'S WASHDAY EASIER** by presenting her with this simple clothespin container. It's just a plastic bottle with a section removed for access. Feed it on the line and it's easy to slide it along



**NEAT LETTERING** for signs, placards and posters is a cinch with this easy-to-make lettering tool. It's simply a pencil eraser, cut at a slight curve. Use with India ink or writing ink for a neat job





# HINTS FROM READERS

## Emergency wrench

When you need an adjustable wrench but are unable to find one, try improvising with this trick. Just thread two square nuts on a long bolt, the longer the better. Turn down the nuts so they slip tightly over the nut to be removed (or tightened); apply leverage as needed. For small nuts you likely can make do with hex nuts on the bolt instead of square nuts (as shown).



## Cutting angle the right way

Save time by starting a hacksaw at the corner of a piece of angle iron instead of sawing down one leg and across the other. Obviously, fewer strokes of the saw are required to completely cut through the angle, thus saving time and labor. Another advantage, although not as obvious, is that the saw will cut more smoothly because more of the teeth will be engaged in cutting through both legs of the angle at the same time. Be sure, however, that the angle is firmly secured in a vise.



## Twisting flat iron uniformly

To keep from producing undesired bends while twisting a piece of flat iron, slip it in a piece of pipe with a diameter slightly larger than the width of the strip of flat iron. Secure one end of the strip in a bench vise and grip the other end with a large monkey wrench. Twist slowly to spiral, but not kink, the strip. If the strip wedges inside the pipe, gently tap it out with a hammer. Alternatively, you could leave one end secured in the vise and tap off the pipe, instead of forcing the strip.



## Polishing attachment for small jobs

For delicate polishing tasks, especially those involving a small, intricately shaped area, try using this highly effective short-cut. Dip a cotton swab into polish, then chuck the swab in an electric drill or hand grinder. With very light pressure, feed the spinning swab against the work until all tiny recesses have been covered. Then clean off the excess polish, chuck a clean swab into the drill and buff the work, again using only light pressure to avoid breakage of the wood shaft.



# Unique Piggyback Speed Reducer

**LIFT YOURSELF** by your bootstraps?

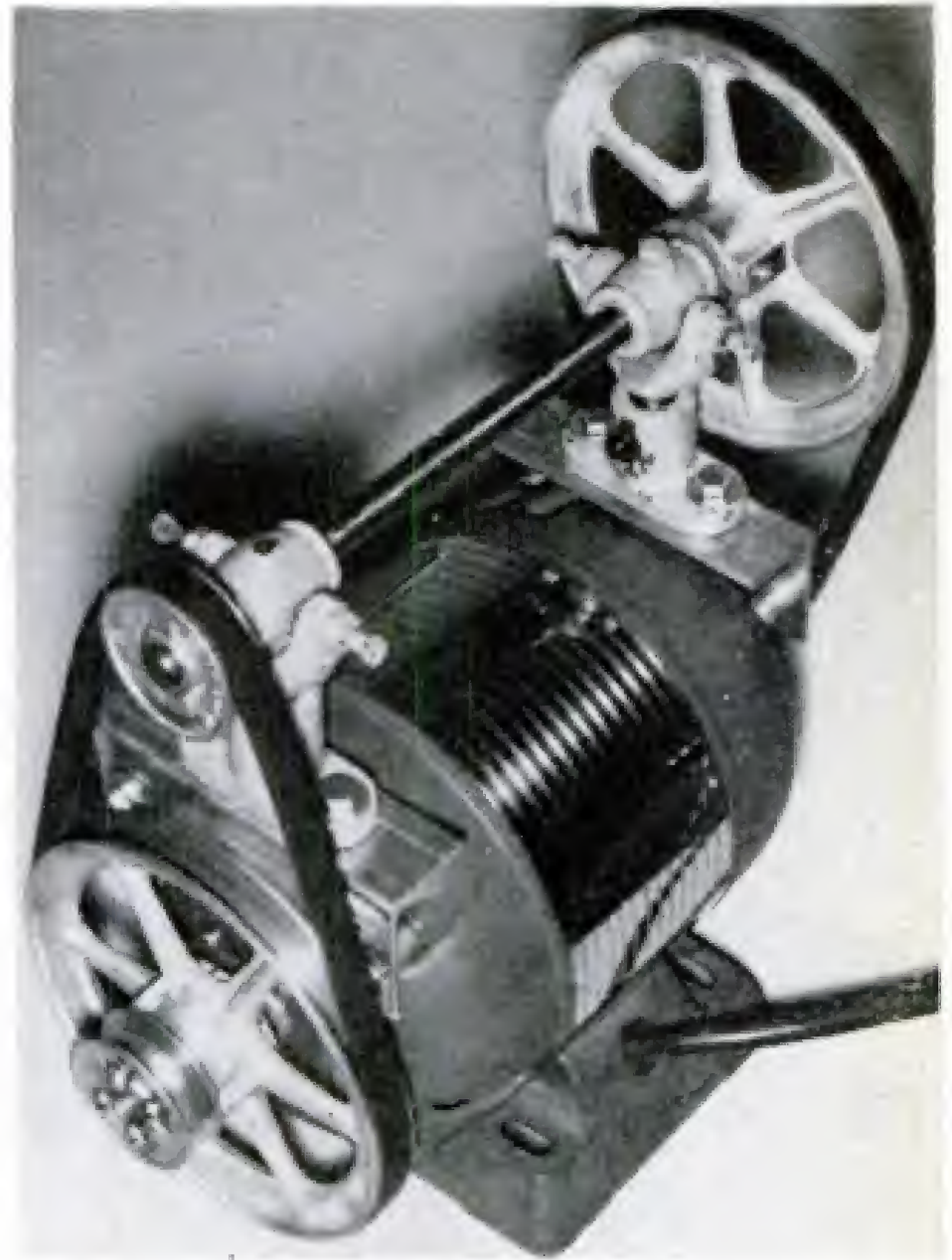
At first glance that's what this novel piggyback speed reducer appears to do, for it cuts your 1725 rpm double-shaft motor to under 200 rpm, and with only one shaft. The secret is that it uses the motor shaft itself as another jackshaft.

The heart of the speed reducer is the 6-in. free-running pulley to which the drive pulley is bolted. It revolves freely about the motor shaft and is driven through speed-reducing pulleys from the other end of the motor. To use the motor at normal speed, you just slip one belt and turn a setscrew to fasten the free-wheeling pulley to the motor shaft.

To construct the piggyback, replace the top motor-housing bolts and replace with longer bolts. Sections of angle iron (the size depends on your particular motor), shimmed out with spacers of  $\frac{1}{8}$ -in. pipe, provide support for the hangers.

Many  $\frac{1}{2}$ -in. motor shafts have a flat ground on the shaft, and provide insufficient bearing surface for a free-running pulley. In this case epoxy a  $\frac{1}{2}$ -in. bronze bushing over the shaft and use a  $\frac{5}{8}$ -in. arbor pulley. If your motor shaft is  $\frac{5}{8}$  in., it probably has a key slot, and no bushing will be required.

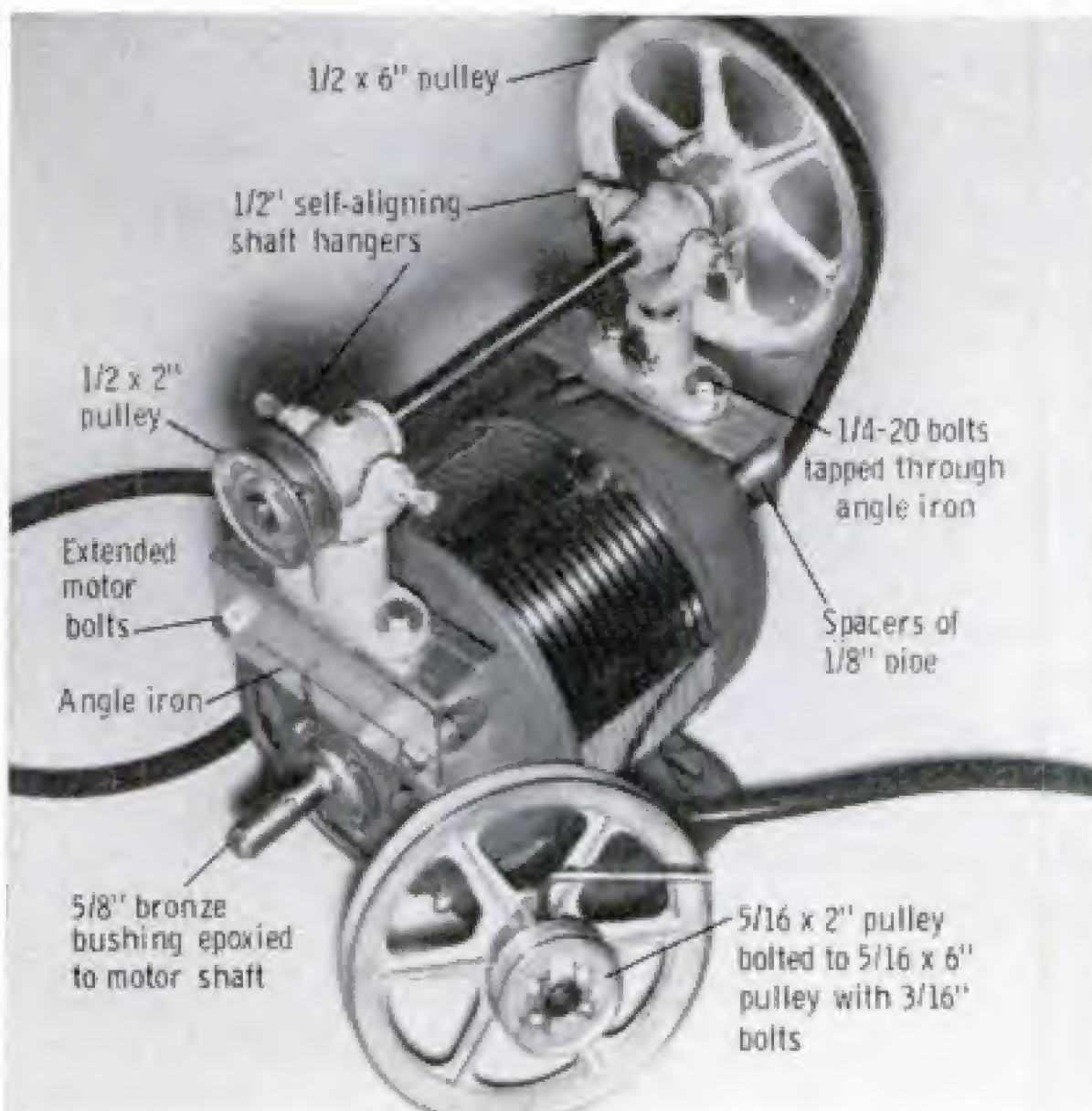
—William Waggoner



**SECRET** of the unique setup is that the large pulley (lower left) is free-running on the motor shaft

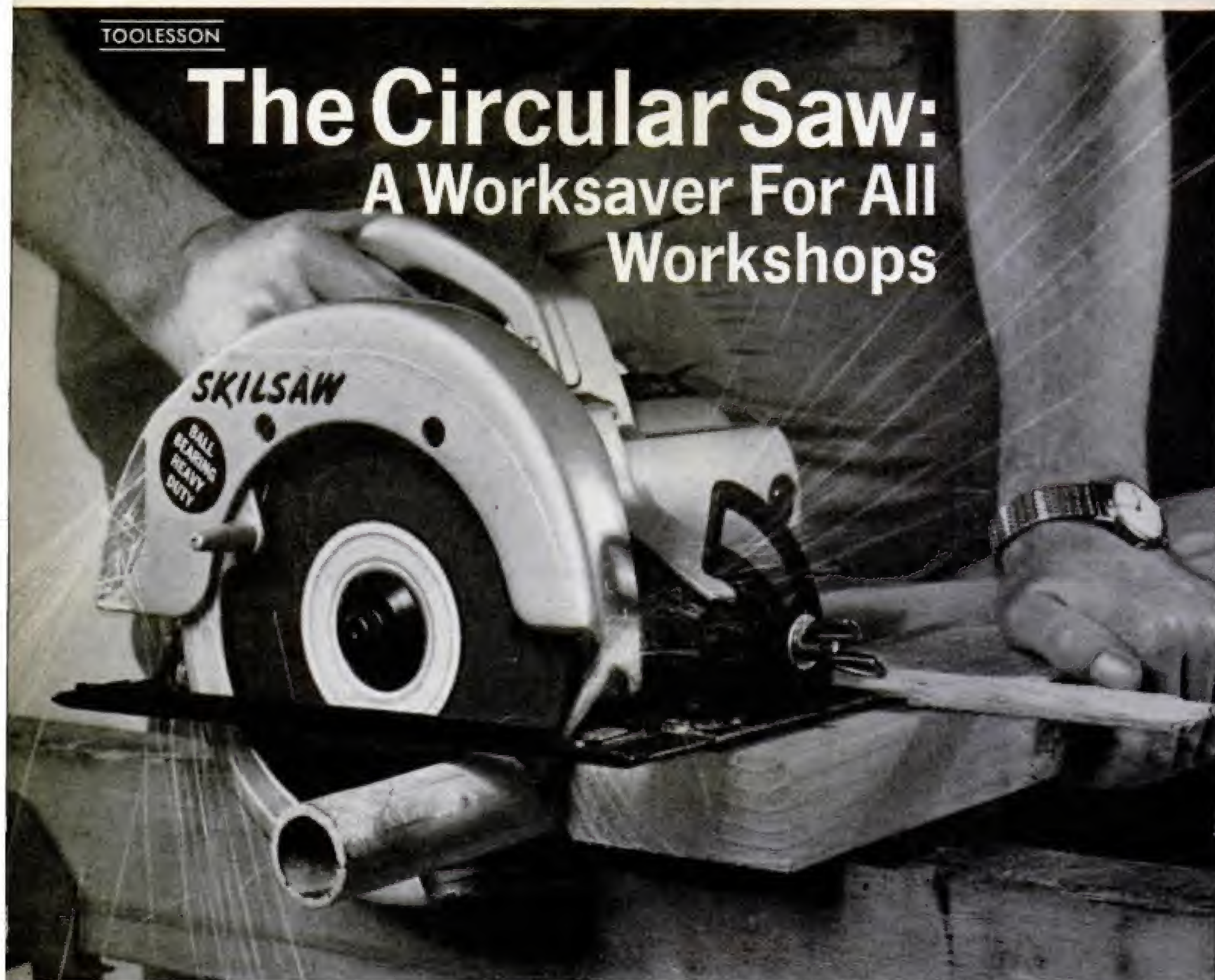
**BRONZE BUSHING** (below left) is epoxied to a  $\frac{1}{2}$ -in. motor shaft to enlarge bearing surface for pulley

**PIGGYBACK SETUP** (below) is ideal for cramped quarters, such as making your bandsaw a metalcutter





# The Circular Saw: A Worksaver For All Workshops



**This little workhorse will not only cut wood, but can also cut your working time and effort, if you know how to use it properly**

By JOHN BURROUGHS

**B**ELIEVE IT OR NOT, portable circular saws have higher power ratings than motors used on table saws. Shop-model portable saws with 6½ to 7½-in.-dia. blades draw around 10 amperes and develop 1 to 1½ hp. Builders' portable saws with 8 to 10-in. blades draw 13 to 14 amps. and develop more than 2 hp—power enough to drive a blade through hard-grained and knotty 2-in.-thick planks almost as fast as you can guide it.

To develop this high power output the saw's universal motor revs to very high speed. The motor armature turns too fast to drive the blade directly, so the end of the armature has a pinion that gear-

drives a short stub shaft. This geared-down shaft turns the blade at the required 4500 to 5500-rpm operating speed.

Two saw blades to handle all ordinary shop sawing are a chisel-tooth combination blade (for general ripping and cross-cutting) and a hollow-ground miter (or planer) blade for fine cabinetwork.

A chisel-tooth blade's special advantage is the ease with which it can be resharpened, since the teeth are ground square-across rather than beveled. This blade can be sharpened quickly on a ¼-in.-thick, round-faced saw-gumming wheel rigged on a bench grinder. If you grind the chisel teeth lightly only on their faces,



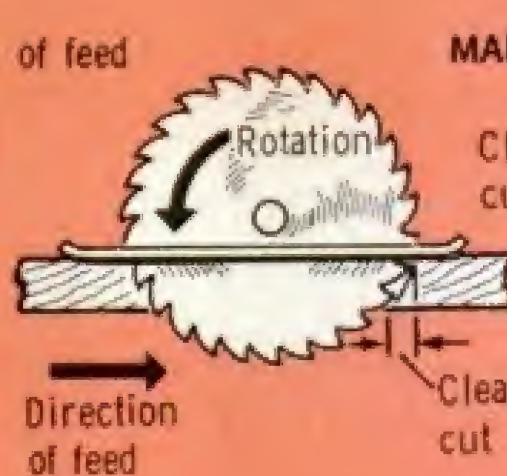
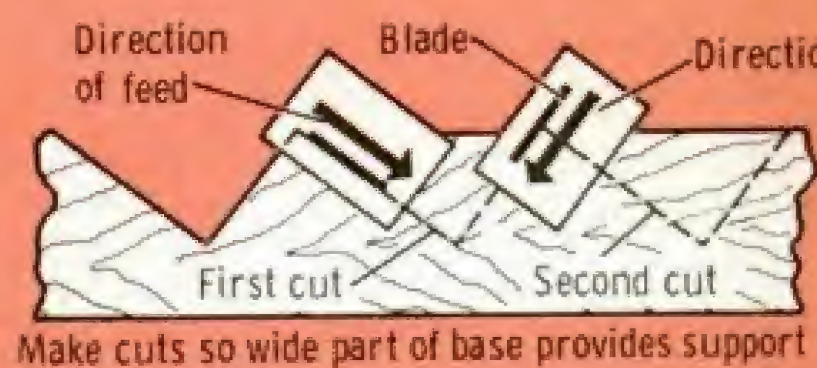
Save the hollow-ground miter blade, which cuts slowly but very cleanly, for your most careful work. Never force a miter blade in the cut, and keep it knife-sharp. When teeth begin to dull, joint and file them lightly with a slim taper file.

Although you can make surprisingly straight cuts freehand, for really accurate

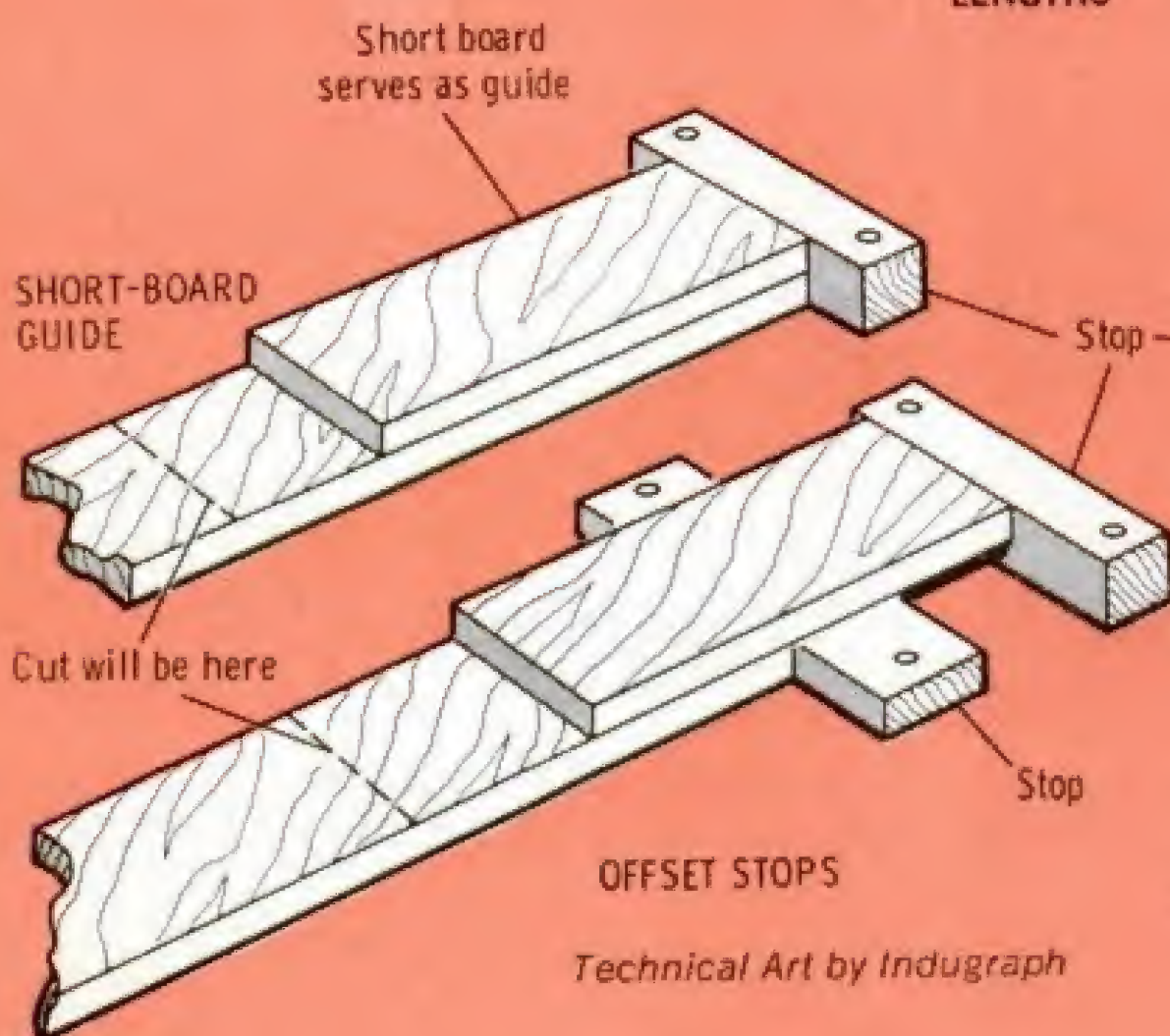
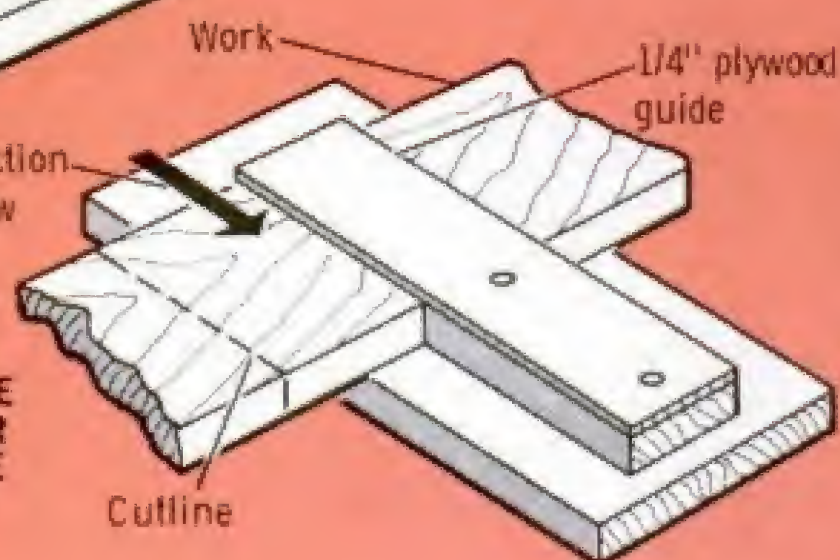
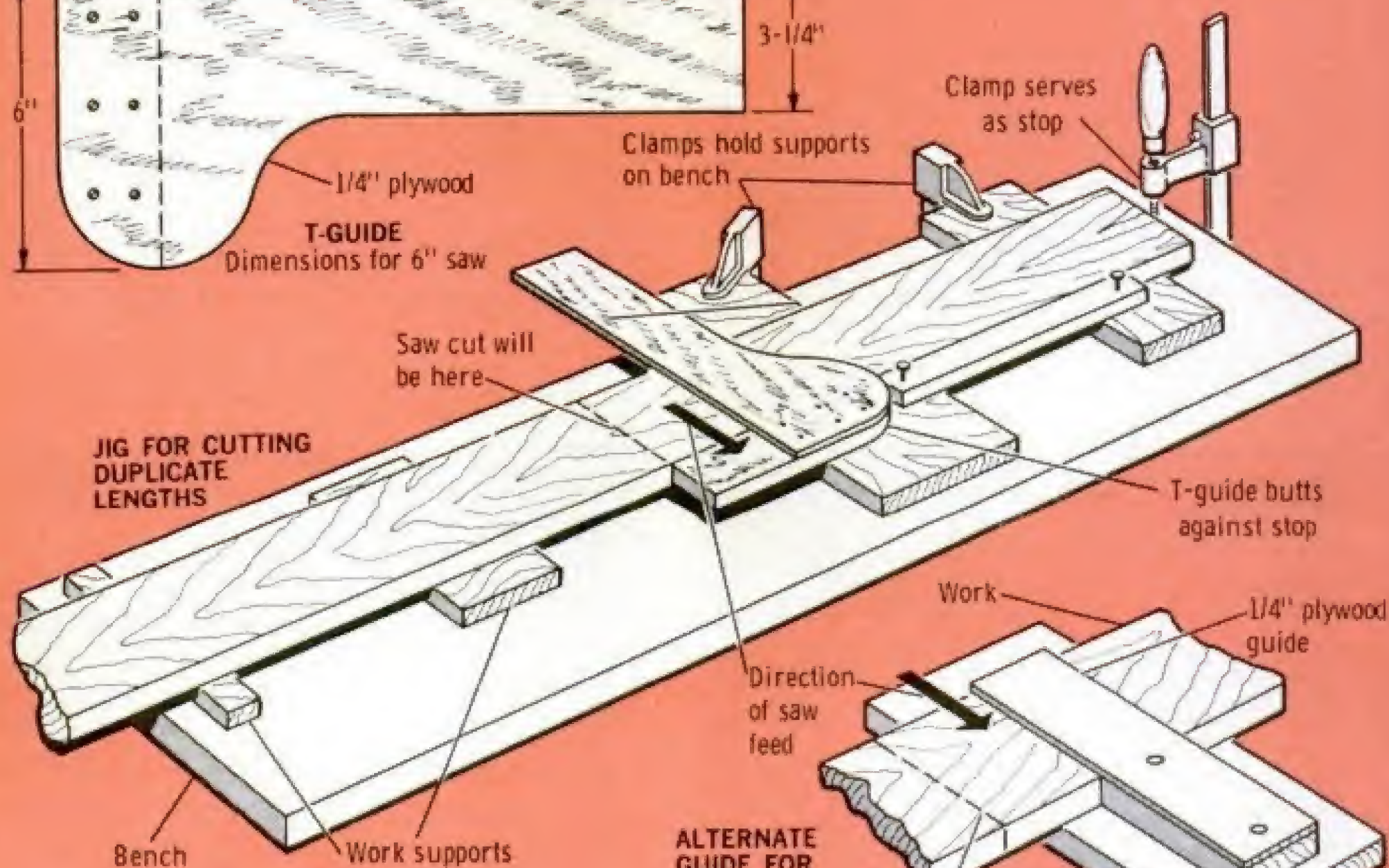
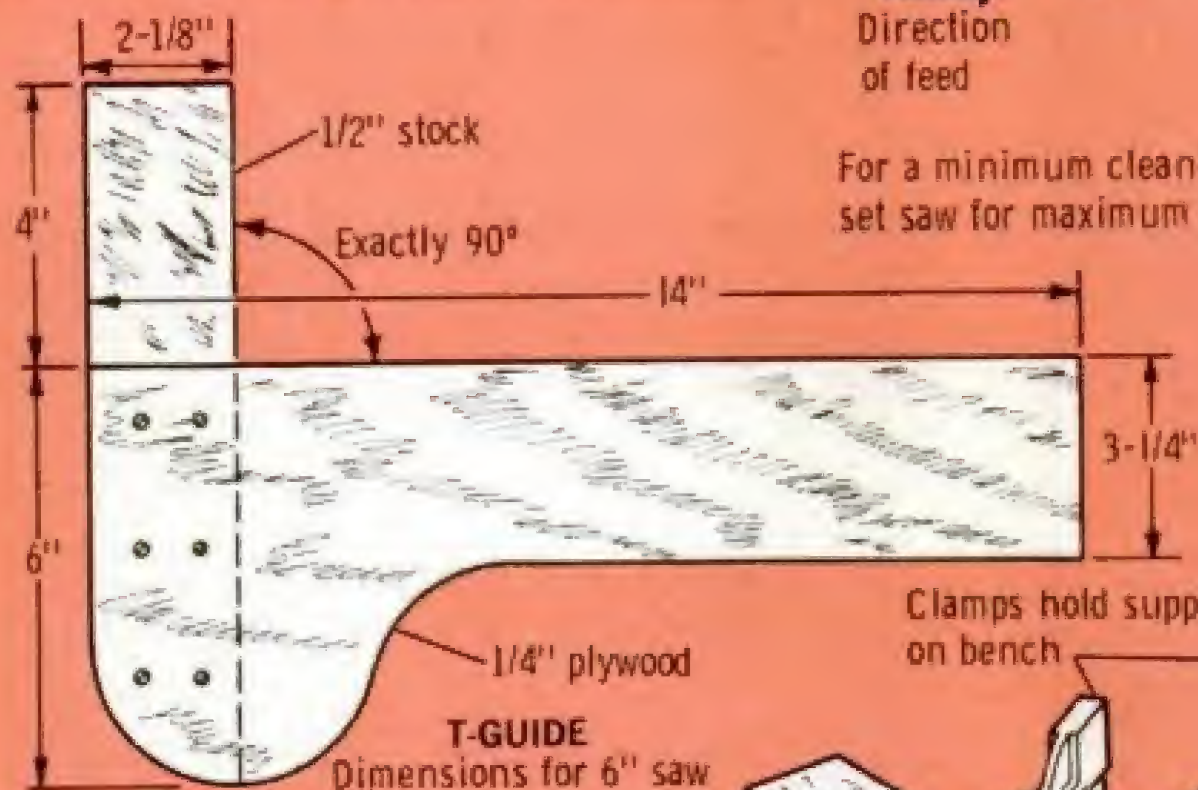
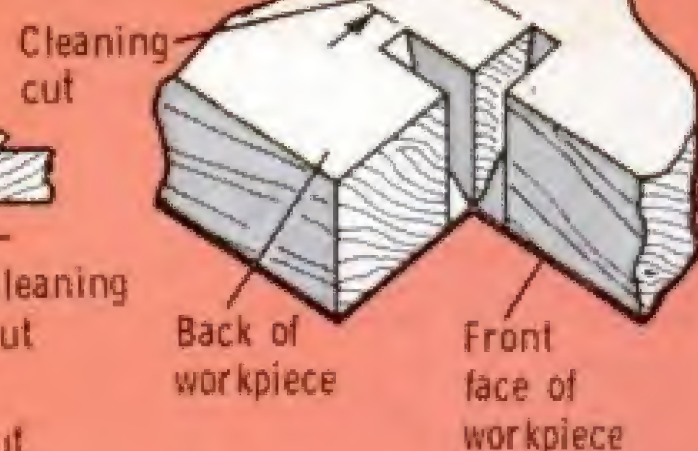


FEBRUARY 1969

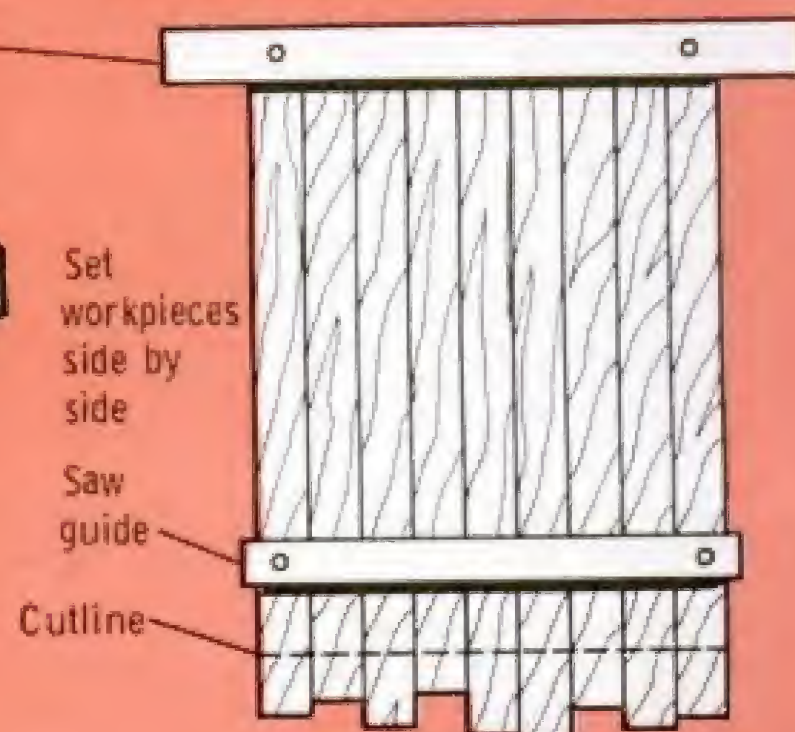




### MAKING 90° CUTS



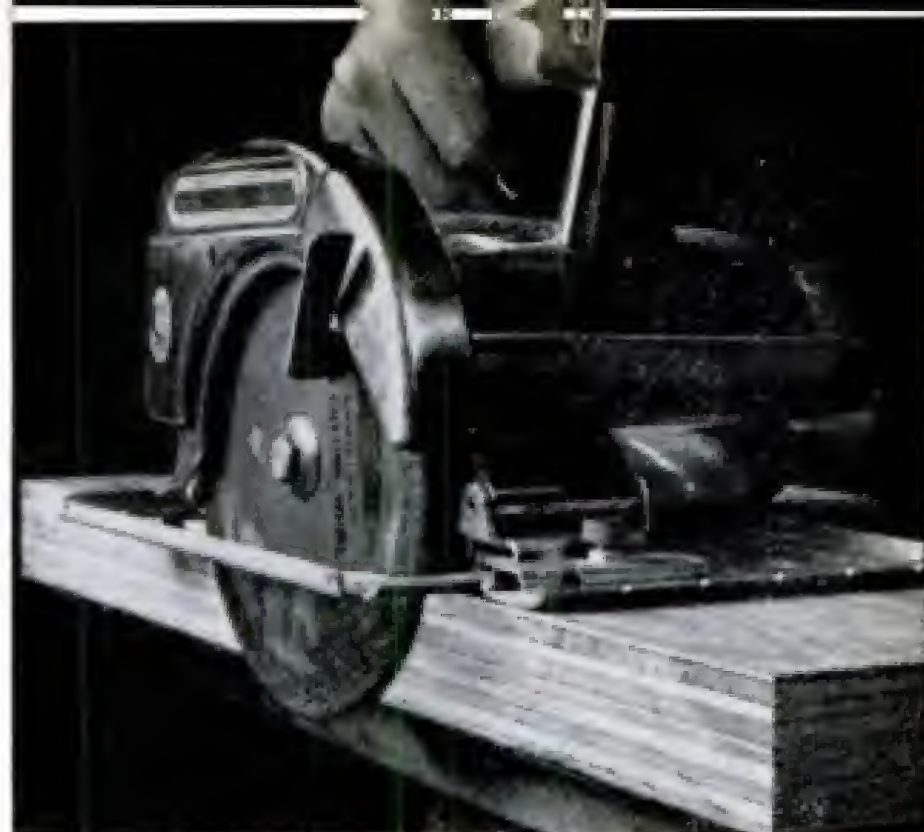
### CUTTING MULTIPLE DUPLICATE LENGTHS



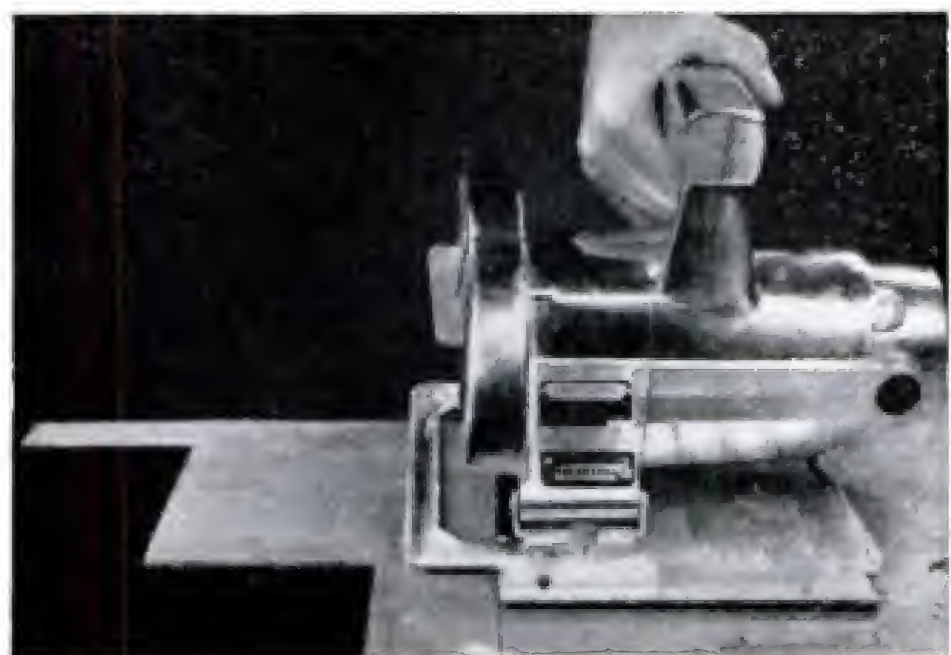




**CLAMP-ON CUTOFF GUIDE** won't sideslip; squeeze-type handle will clamp lumber up to 12-in. wide



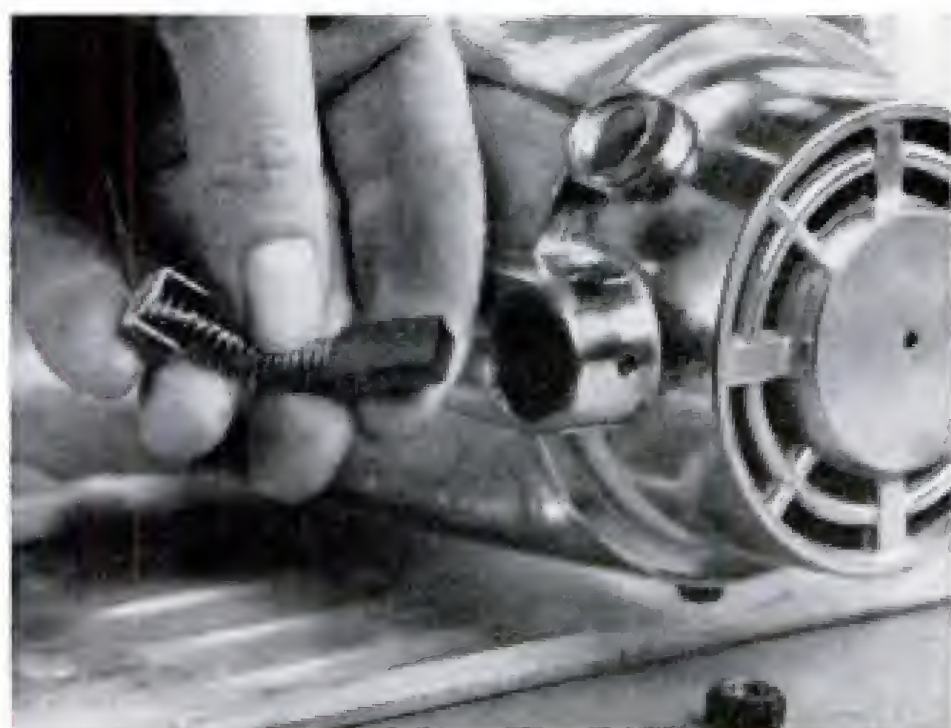
**RIM-CUTTING, CARBIDE-GRIT WHEEL** can be used for edge sanding, notching or grooving. Take light cuts



**FINE-TOOTH, METAL-CUTTING BLADES** will slice through soft brass and sheet aluminum, but not steel



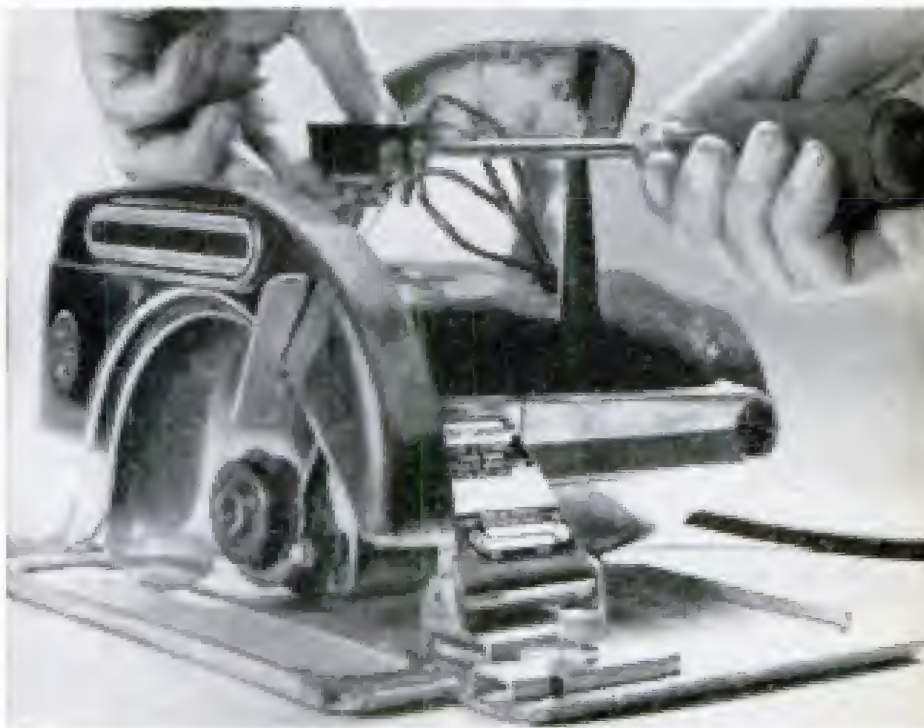
**BLADE CLEANING SOLVENT** makes it easy to remove pitch from saw blades, carbide-grit sanding wheels



**CHECK CARBON BRUSHES REGULARLY.** When they wear to half their original length, install replacements

work the saw shoe should be guided along a clamped straightedge. Using a straight-edge several inches longer than the work makes it easier to start the cut. With either a simple straightedge or one of the worksaving jigs shown opposite, always advance the saw with a slow, even feed and avoid heavy lateral pressure.

Other than checking the motor's carbon



**TRIGGER SWITCHES** can be replaced, but for long switch life, always avoid starting motor under load

brushes occasionally, a portable saw needs little maintenance. Nearly all models have sealed, lubed-for-life bearings, and several have sealed, permanently-lubed gearcases. If your tool's gearcase requires periodic relubrication, use the special grease specified by the manufacturer. Since grease expands as it heats, avoid filling the gearcase more than half full. ★★★





# HINTS FROM READERS

## Modeler's refinery

A surprisingly realistic refinery for an HO-ga. model-train layout can be fabricated of empty cylinders of butane or propane gas and the plastic remnants of a model car or airplane kit. Simply save the "trees" on which the kit parts are attached and cement them to the tanks or round mailing tubes. When sprayed with aluminum paint, they look like the real thing.

—Hank Clark



## Double-duty lathe brush

This novel cleaning tool will help you to keep the chuck and leadscrew on your metal-turning lathe free of troublesome chips. It's made of two old toothbrushes fed back-to-back on a suitable ring, with a pad of rubber taped to the back of one of the brushes. To clean the chuck, squeeze the handles together and feed the brushes into the chuck. They will spread apart and clean the inside threads. For cleaning a leadscrew, flip the brushes so they face each other.—Peter Legon



## Clamp instead of vise

The next time you're faced with the problem of how to mount an irregularly shaped piece of work that won't fit the normal jaw opening of a conventional vise, try this simple trick. Mount the work in a C-clamp of the proper size for the job, and then mount the C-clamp in a vise. This shortcut is especially useful when you're working with a soft or highly finished piece of metal that could be damaged in the vise jaws. It will also avoid possible flattening of thin wall tubes or pipes.



## Hinge makes king-size pliers

A large hinge should be kept handy for the occasional odd job that requires a wide-gripping pair of jaws. Just slip the hinge over the work and clamp a pair of pliers over the joint of the hinge leaves. As shown in the photo at left, this tip makes easy work of bending light-gauge sheet metal. It will also come in handy whenever you find it necessary to break off scored strips of glass from a large section and want to be sure of a clean break every time.—Albert Pippi



# New Tools You Should Know About



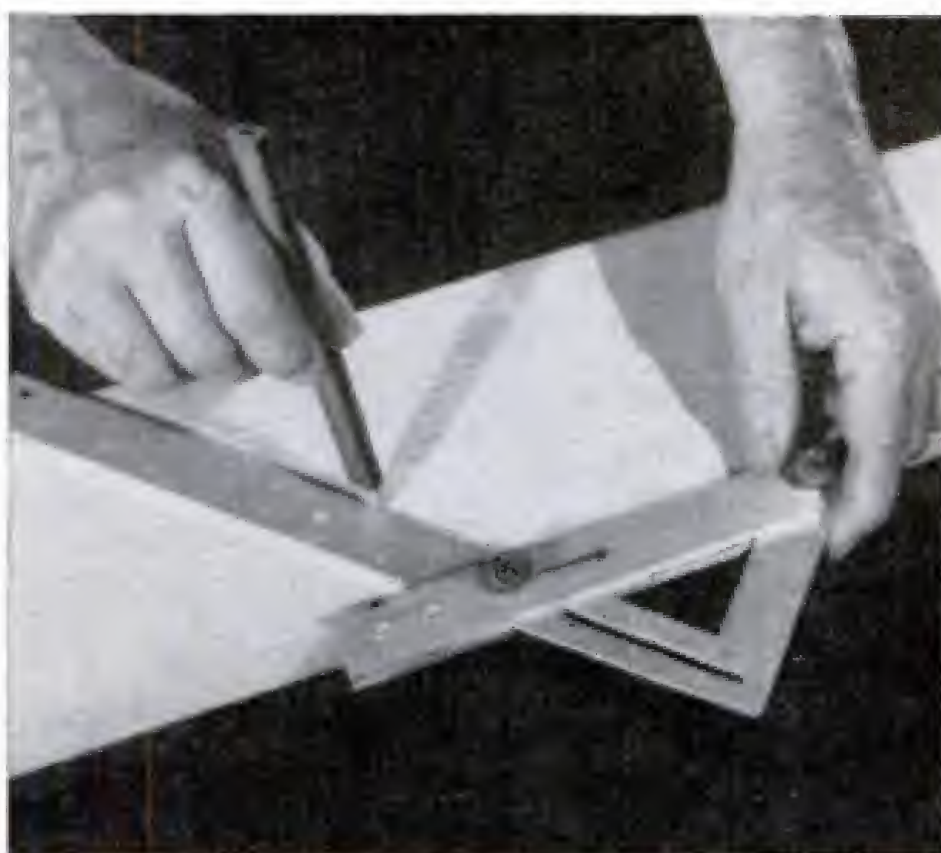
## Multipurpose wrench

Nine tools in one, it functions as a socket wrench, monkey wrench, open-end wrench, pipe wrench, slip-joint pliers, lineman's pliers, small vise, wire cutter and clamp. The jaws, which grip like a vise, remain parallel in all positions, and grip any shape—round, hex or square. Plierench is available in two sizes for \$6.25 and \$7.95. Vaco Products Co., 510 N. Dearborn St., Chicago, Ill. 60610.



## Ball-tip internal gauges

Internal gauges with ball contact points have a jeweled movement which operates on a unique "scissors" action. They're designed for measuring the inside diameters of ball races, O-ring grooves and similar applications. Direct-dial readings are in .001 in. Gauges, in 12 models, range from .2 in. to 4.8 in. Other contact points are available. The Dyer Co., Oberlin, Ohio 44074.



## Adjustable square and angle

While it's a square, protractor, level, saw guide, T-square, sight-plumb, straightedge, layout jig, pitch finder and rule all in one, you can do 18 different jobs with this unique tool called Squangle. It assembles in four different positions by loosening two nuts and bolts, then sliding the arm and blade, as necessary. Attached to fully illustrated folder, it sells for \$3.35 by Great Neck Saw Manufacturers, Inc., Mineola, N. Y.



## Compact tube cutter

This tiny tube cutter is designed for use in tight quarters such as refrigeration systems and instrument panels. It requires a swing radius of only 1 1/4 in. to cut tubes up to 1/2 in. in diameter. The cutting wheel is easy to adjust for tube diameters from 1/8 to 5/8 in., and will cut copper, aluminum, brass, thin-wall steel and titanium tubing. Imperial-Eastman Corp., 6300 W. Howard St., Chicago, Ill. 60648.



# MAKE A KING-SIZE TOOLPOST FOR HEFTY TURNING BITS

By WALTER E. BURTON

**H**EFTY, HIGH-SPEED steel or carbide bits are more rigid and in other ways superior to the toolholder-bit combination widely used on small lathes—but a conventional toolpost has too narrow a slot to accommodate them. Even if the slot were wide enough, some sort of

block or shim system would have to be improvised to position cutting edges at the proper height.

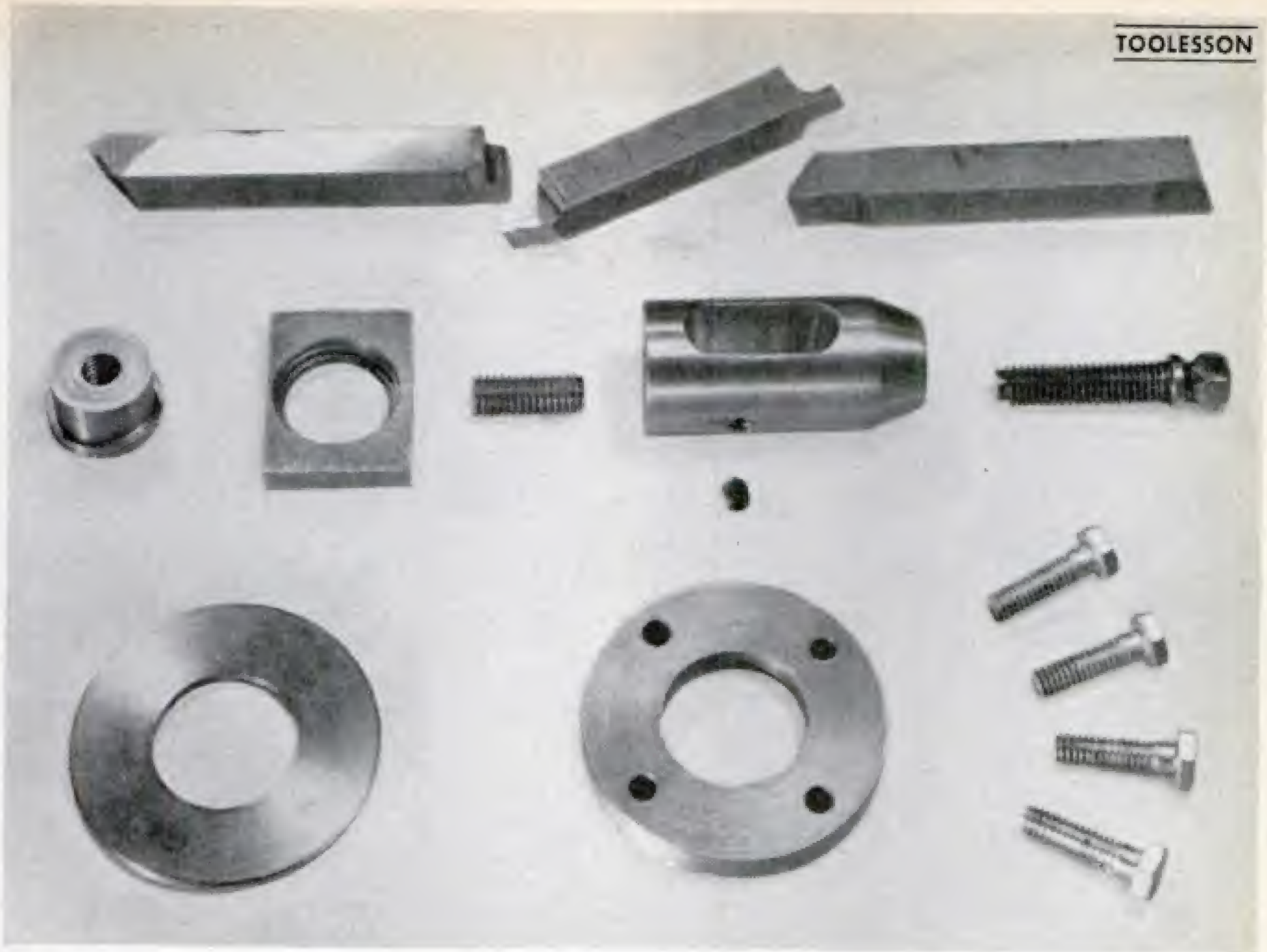
Not so with the toolpost shown, however, since it was specifically designed to accommodate bits up to  $\frac{1}{2}$ -in. wide. It has an easily set height-adjustment feature

**OVERSIZE POST** starts out as a  $1\frac{1}{8}$ -in. steel rod. Bottom hole is drilled and tapped for mounting stud

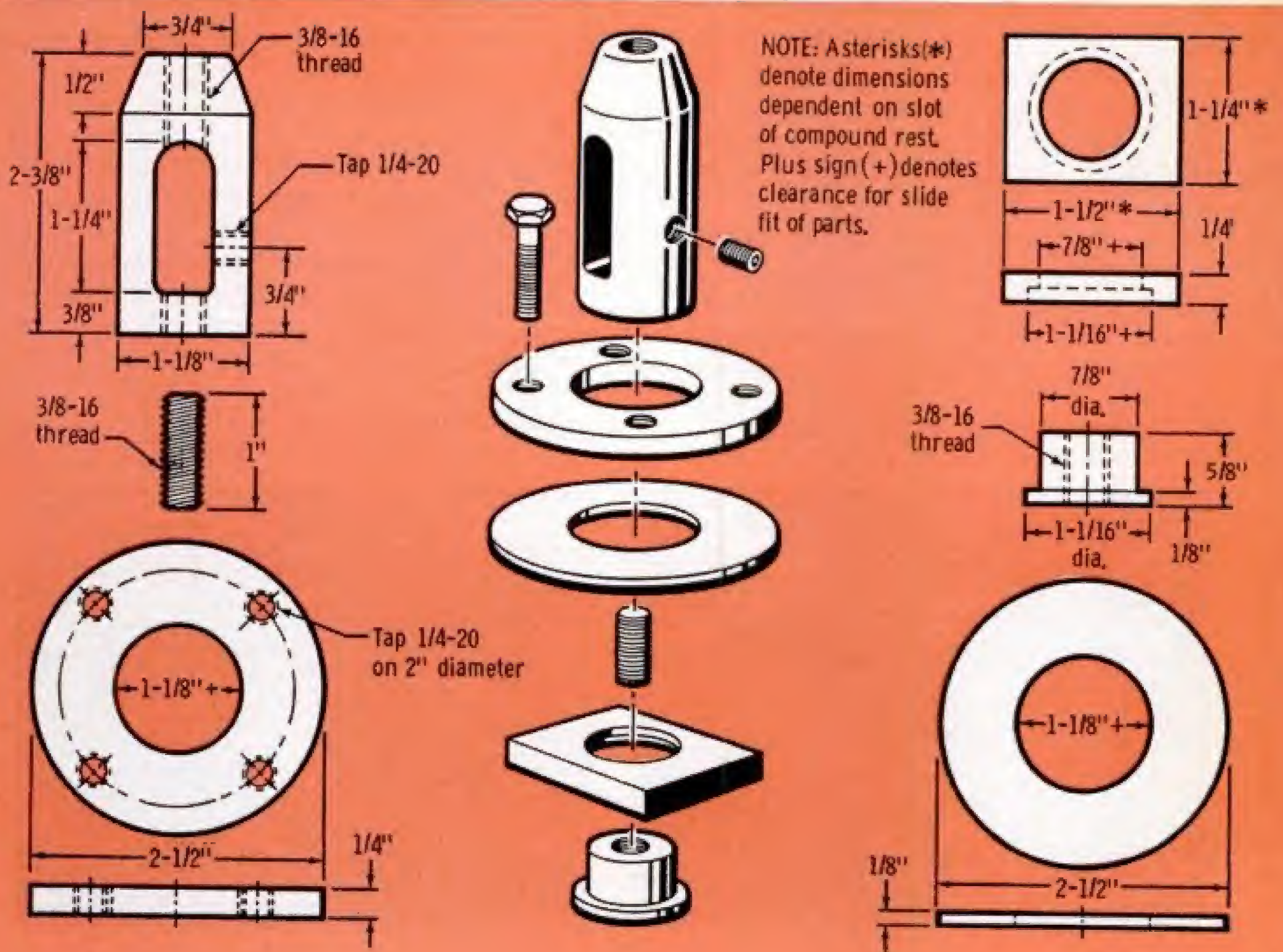
**TOP HOLE** should be drilled and tapped for a  $\frac{3}{8}$ -16 clamping bolt, preferably one with a square head







**EASY-TO-SHAPE PARTS** go together as shown in the exploded view below. Two setscrews may be needed







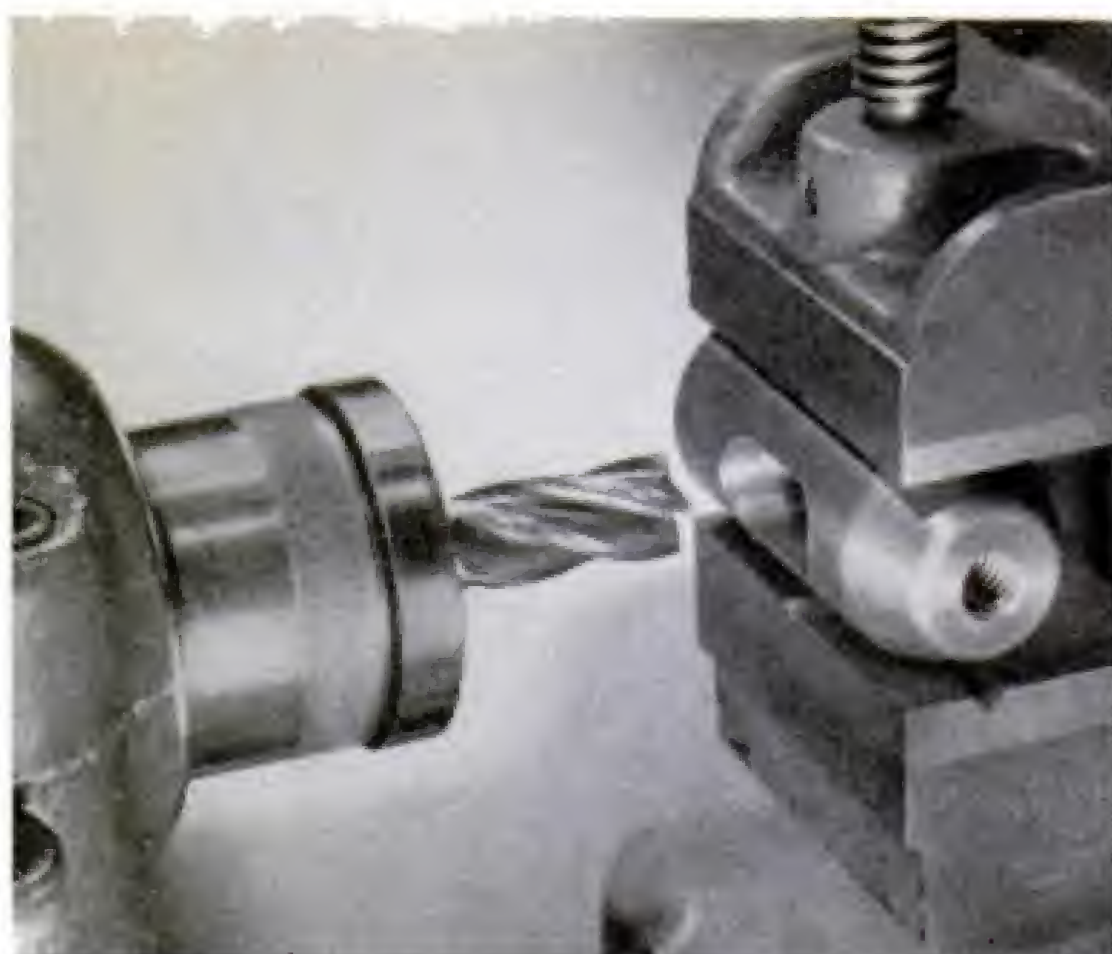
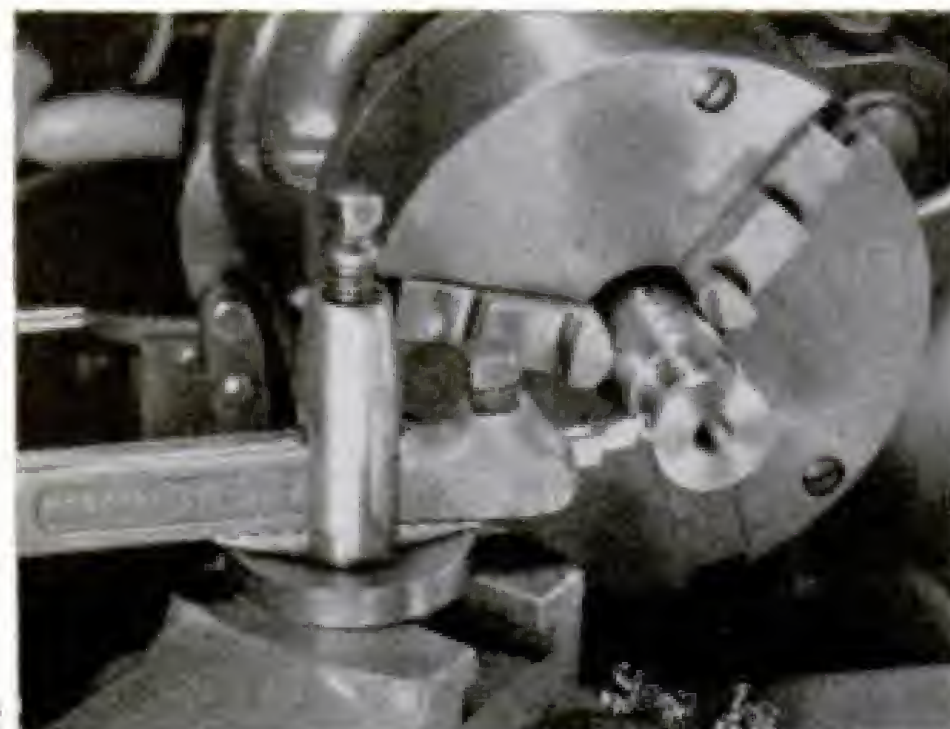
**TO CUT SLOT IN POST**, first drill two  $\frac{1}{2}$ -in. holes about  $\frac{3}{4}$ -in. apart (measured from center to center)

consisting of a steel ring supported by a quartet of bolts. It also provides firm support for boring bars or large bits ground as boring tools. All parts can be made of ordinary or tool steel, although for maximum durability, parts subjected to wear should be hardened.

Because of the wide tool slot, the diameter of the post is greater than that of the conventional post—yet the button and the block forming the base of the post assembly must be kept small enough to enter the toolpost T-slot on the compound rest. Therefore, the post assembly must be made in two sections so that the block can be installed (these sections are held together by the  $\frac{3}{8}$ -16 stud).

The  $\frac{1}{4}$ -20 setscrew in the side of the holder will prevent possible side shifting of the bit, especially when it does not

**BUTTON ON BOTTOM OF POST ASSEMBLY** is machined to fit T-slot, then fitted on  $\frac{3}{8}$ -16-thread stud



**MILLING IS BEST WAY** to remove rest of material. Alternately, excess metal could be sawn and filed

completely fill the wide slot. You could install two or more screws, if required, which would be most effective when the bit is making heavy side cuts.

The tool bit rests on a ring assembly consisting of a thick upper ring through which four  $\frac{1}{4}$ -20 bolts extend to rest on the thinner ring. By adjusting the 1-in.-long bolts to control the height of the upper ring, it's possible to set the bit at the proper cutting height. It's also possible to tilt the bit and vary the effective rake.

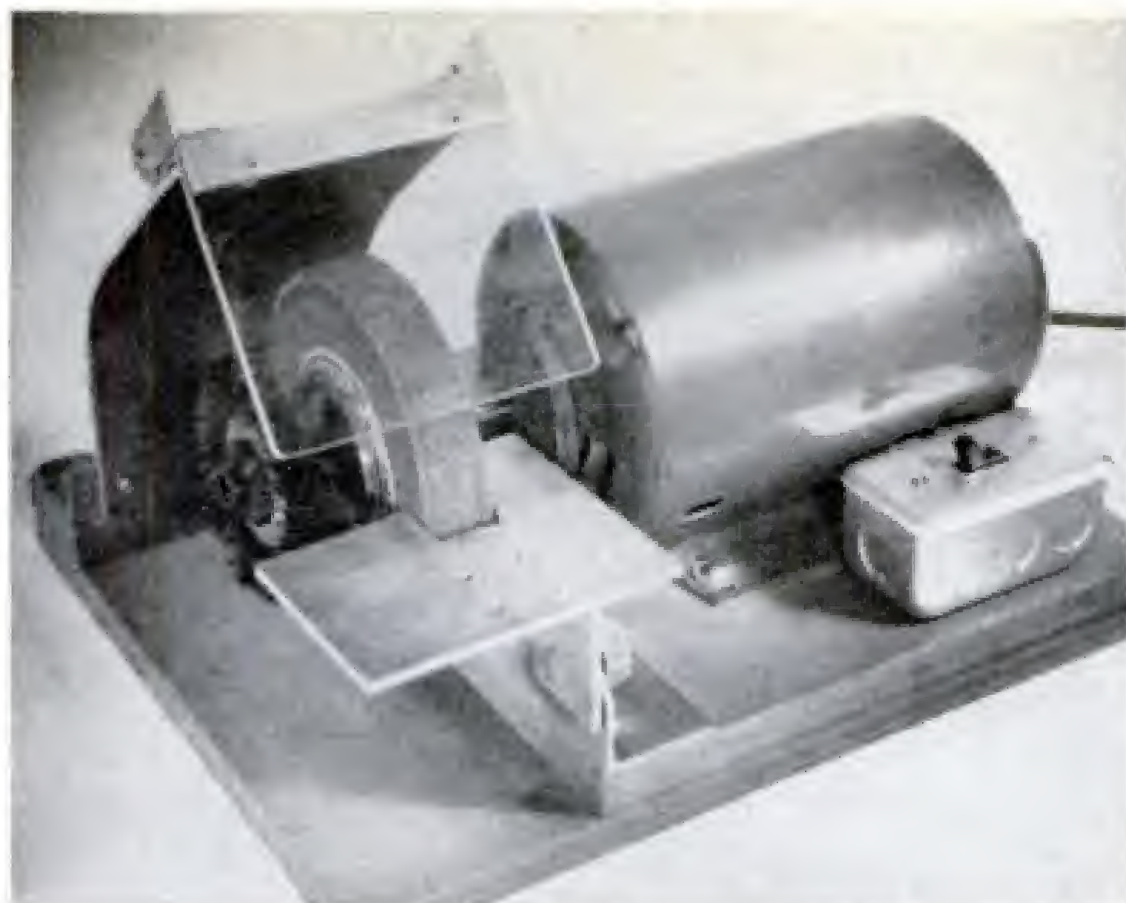
The top bolt used to exert downward pressure on the tool bit should be a standard  $\frac{3}{8}$ -16, square-head toolpost bolt. The dimensions in the drawing are for the holder shown, which will handle up to  $\frac{1}{2}$ -in.-thick bits on a 9-in. lathe. Of course, for other lathes or different bit sizes, it may be necessary to vary dimensions. ★★★

**BUTTON SHOULD BE LOOSE FIT** in shouldered block. Check clearance before removing block from lathe

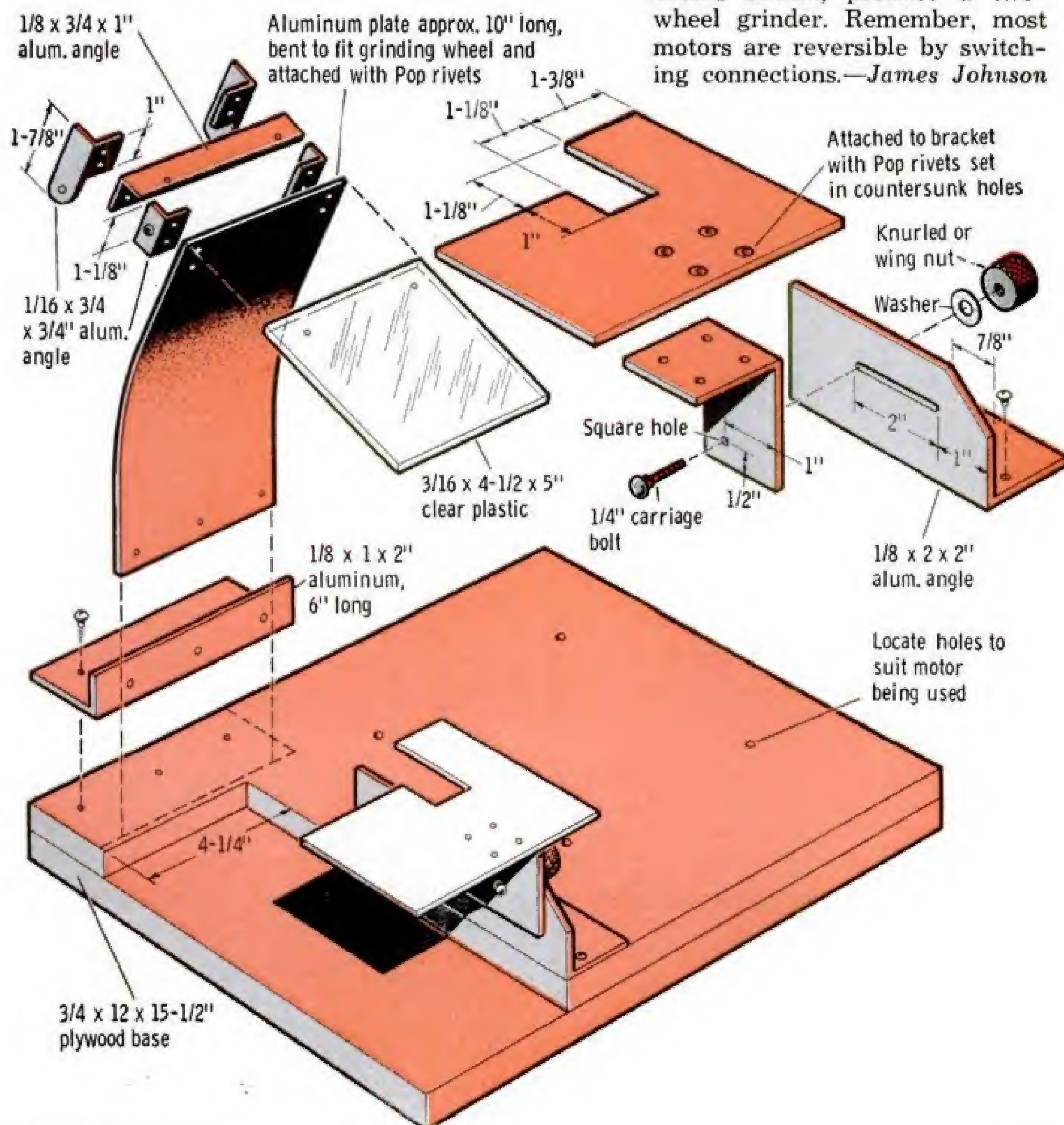




# BENCH GRINDER



IT SHOULDN'T COST you more than \$6 or \$7 to make this bench grinder since you likely have a suitable motor that's been salvaged from an old tool or appliance. In fact, you might even look around for a double-shaft motor and, using the same construction details shown, produce a two-wheel grinder. Remember, most motors are reversible by switching connections.—James Johnson





# HINTS

FROM READERS



## Cross-drilling bolts

It's easy to drill accurately through the center of a bolt with this method. Simply run a suitable nut on the bolt and use this as a flat which you can centerpunch and drill. It may be worthwhile to drill the nut first.



## Drilling angled holes

When it's necessary to drill into a piece of work at an angle, it will pay first to mill a small flat on the work. When centerpunched, the flat will prevent runoff of the bit and keep it from bending and possibly breaking.



## Substitute chuck key

Here's a fine old trick worth remembering—you can tighten or loosen a chuck on a drill press or portable drill by using a rod and screwdriver. Just insert the rod into side of chuck and use the screwdriver as a lever.

## Replace worn cartop carrier straps with rubber bands cut from inner tube

When the web straps on your cartop luggage carrier become badly worn and frayed, replace them with 1½-in.-wide rubber bands cut from an inner tube.

Loop the band around the leg of the carrier, then feed the other end through the slotted clamp and over a dowel to keep it from slipping out.—G. K. Hawk

## NEXT MONTH IN SHOP AND CRAFTS

**HOW TO SOLVE YOUR PARKING PROBLEMS.** Widening your driveway is the obvious solution to a parking problem, but for a number of other practical alternatives, next month's story is required reading. All, however, will let you and your guests park off the street. Among the eight solutions you should find one that suits your home.

**HOW TO BUILD A COLD FRAME.** Basically a simple version of a greenhouse, this cold-frame shelter will let you grow seedlings throughout the spring months. Presented in color, this simple project will pay off handsomely in healthy plants ready for transplanting. It's made of fiberglass and comes apart in sections for summer storage.

**\$16 KIT MAKES YOU A WHIZ IN MODEL ROCKETRY.** This easy-to-put-together kit uses a safe liquid propellant to send a rocket to heights of 1000 ft. Among the components of the kit is a working parachute that will bring both engine and nose cone safely back to earth. It fires electrically by battery. It's ideal for getting started in model rocketry.

**HOW TO USE A STEADY REST.** Lathe-turning long rods, tubes and pipes require that you know how to use either a steady rest or a follower rest for a specific job. For the complete story, be sure to read the March issue of *PM*.



# Mercury '69: The outboards that take care of themselves

## like no others can.

Everybody talks about saltwater corrosion (it can happen in polluted fresh water, too). Mercury does something more about it this year. Every new Mercury outboard is built of a special new aluminum alloy, "XK." It's more corrosion-resistant than other aluminum alloys used in outboard motors—and it's 40% stronger. Everybody talks about paint scuffing and peeling. Mercury does something about that, too. A new 4-coat baked enamel finish goes farther to prevent paint failure than anyone's ever gone before.

Corrosion resistance and a new finish that's tough as nails. Two more reasons to choose Mercury (if you needed any more).



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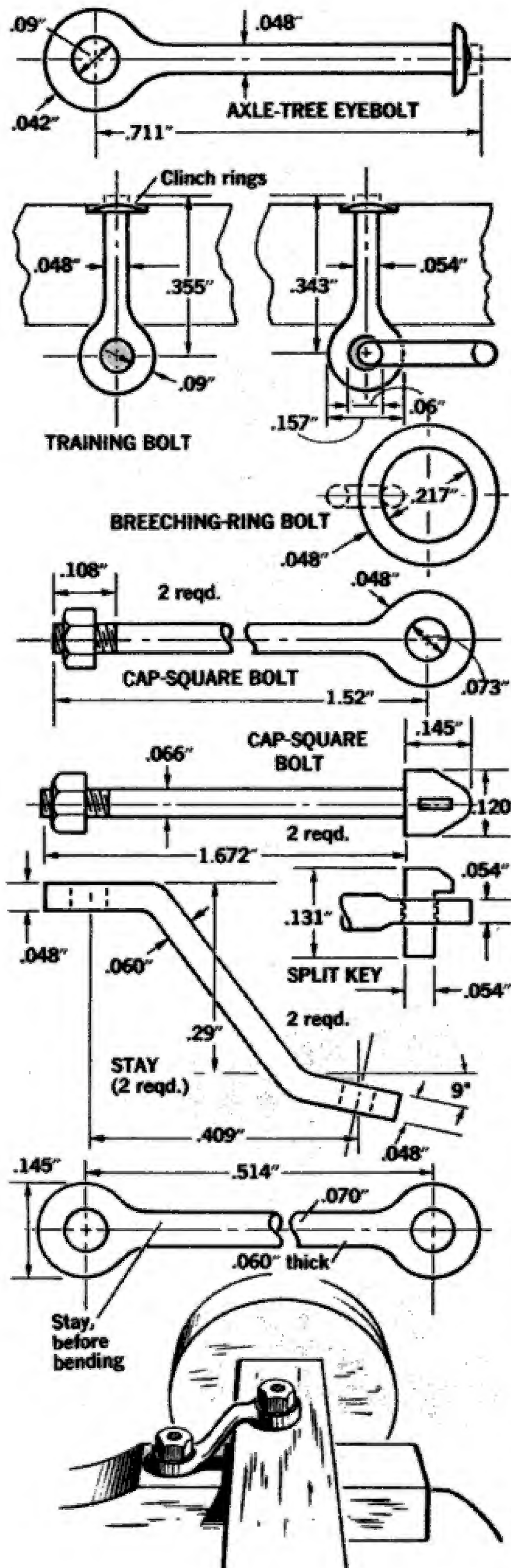
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## MODEL THIS 24-POUNDER

(Continued from page 138)



taper upward slightly from the base to top.

Carriage parts are shaped from black walnut and glued in the order shown. The trucks of the original cannon were built up in layers, as detailed for the model, but you can cut them from  $\frac{1}{4}$ -in. stock and represent the joints with knife cuts. Note that hind trucks are smaller than the fore trucks. Use tiny brass escutcheon pins for rivets—a paper pattern will help spot them around the face of the wheels.

Round ends of the fore and hind axle trees can be "turned" to fit the trucks with a homemade plug cutter chucked in the drill press. It's made from  $\frac{1}{8}$ -in. pipe reamed with a  $\frac{7}{16}$ -in. twist drill. Form teeth around one end with a file. Axle-tree ferrules are turned from brass rod and bored to form a press-fit ring.

Tie bolts and cap-square bolts are shown full length, but you can simulate them merely by inserting the "heads" of the bolts in shallow undersize holes. Likewise, the eyes of the eyebolts need not be solid rings, as shown. Simply form an eye with needle-nose pliers and force it into the wood so you can't see the open end. If you can find actual bolts and nuts from junked timepieces, your model will look more authentic.

Cut stays for the fore axle tree from .060-in. brass sheet, then file, drill and bend to shape. Shape the linch pins from fair-size brass escutcheon pins, filing a flat on their heads to clear the axle trucks.

Cap squares that clamp over the trunnions can be shaped from .060-in. brass. File away the middle portion to .024-in. thick, then cut the piece in half lengthwise to form the two cap squares. Round the thick ends remaining as shown and form the slots by drilling and filing. Brass should be soft enough to bend easily around the trunnions. Note that one end of the cap squares pivots on an eyebolt while the slot in the opposite end engages a bolt with a slotted "head." A brass split key fits the slot and locks the cap square around the trunnion.

The base detailed on page 138 represents a section of sloping deck and ship rail. Make it of walnut to match the carriage or of lighter, contrasting wood. For a darker tone than you get with clear lacquer, rub in boiled linseed oil and let dry a day or two. Or, seal the first or second application with thinned shellac (after oil has dried), sand lightly and apply a final lacquer coat.

Take your time finishing your model. Many otherwise fine models are made less perfect by careless finishing. ★★★





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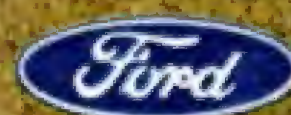
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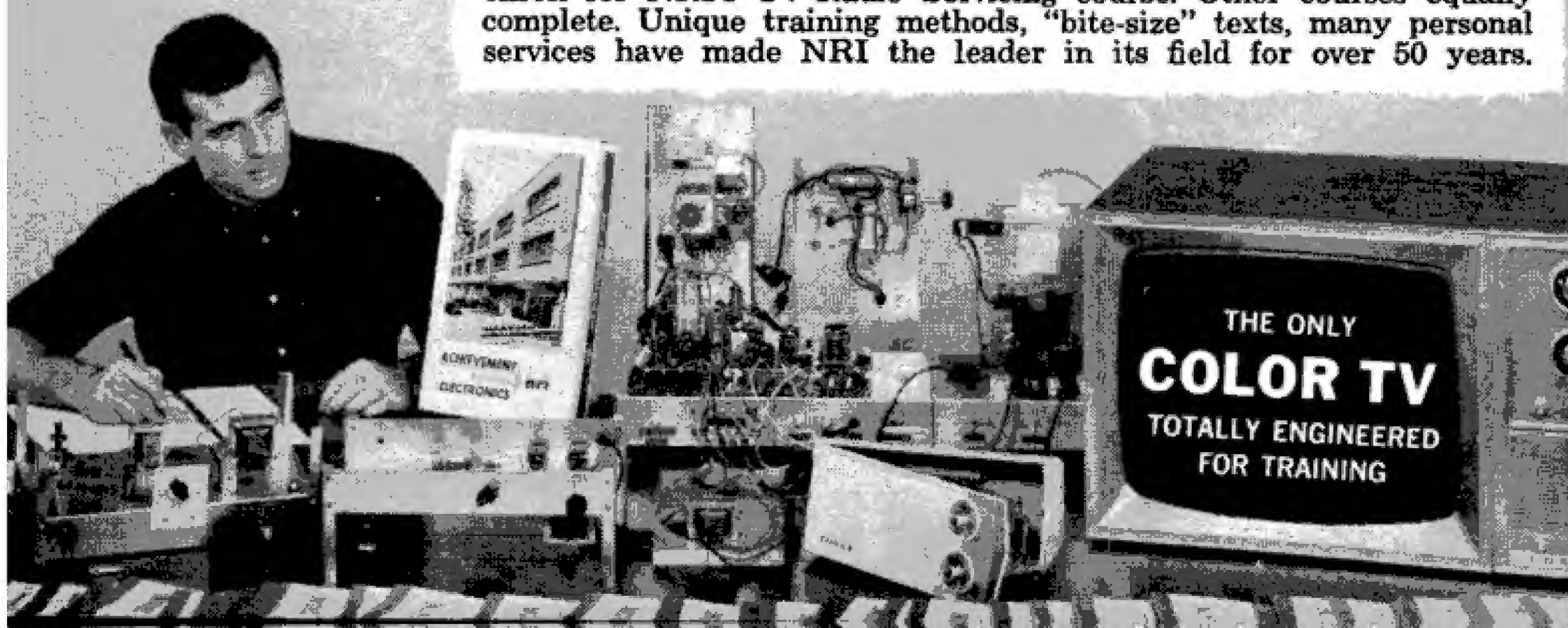
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## HOW DEEP WILL DIVERS WORK?

*(Continued from page 95)*

tasks in the water, each man still linked to the chamber by his own umbilical of cables and hoses, including a hot-water hose. Through a special face mask, he breathed oxygen and helium from a backpack, to which the exhaled gas was also returned for removal of carbon dioxide and replenishment of oxygen.

All six divers lived in the deck chamber, at the 350-foot storage pressure, during three days of diving. Then they spent two-and-a-half more days in the chamber, slowly decompressing under the control of a fail-safe analog computer regulating the supply of gases, before they could come out.

The Ocean Systems dive, sponsored by Esso Production Research Co. in August, 1967, took place in almost the same location in the Gulf of Mexico, and also demonstrated maintenance work on an offshore wellhead. Two divers made a series of three dives to 636 feet, spending a total of 48 hours at the 600-foot pressure, including six hours in the water.

In March, 1968, Ocean Systems divers made an even deeper plunge—to 700 feet off Great Stirrup Cay, in the Bahamas. They used Ed Link's submarine *Deep Diver*, the world's first "lock-out" sub. (It's a true free-diving sub with a lock chamber from which divers can operate at deep-sea pressure, while the submarine crew remains at surface pressure in a separate compartment.) The divers reported they didn't experience pressure effects any different from those at 200 to 300 feet.

Man-in-the-Sea has become almost as complex as Man-in-Space. The array of sophisticated hardware effectively protects divers against the four major hazards of the depths: the bends, caused by the pressure of the sea; nitrogen narcosis, the "rapture of the deep"; poisoning by life-giving oxygen itself; and the near-freezing temperature almost always encountered in deep water.

### **Quick relief from the bends**

Saturation diving, pioneered by Capt. George F. Bond, head of the Navy's Experimental Diving Unit and the moving spirit of Sealab, takes care of the bends.

This risk exists because a diver must breathe air or a gas mixture at the same pressure as the water around him, to avoid being crushed by sea pressure. Some of the breathing gas dissolves in his blood and tissues. When he decompresses, the gas comes out of solution. If decompression is too fast, bubbles trapped in

joints or the nervous system can cause excruciating pain, paralysis, or death.

Capt. Bond realized that the solution was simple: Don't decompress between dives. Once a diver has become "saturated" at a specific depth, no more gas can go into solution as long as he remains at the same pressure. Thus, the time required for decompression does not increase.

With a system like Cachalot, if a diver gets the bends, it's easy to recompress him, since he's already in a chamber. This provides quick relief, then decompression is resumed, more cautiously.

Like the bends, nitrogen narcosis and oxygen poisoning result from increased concentrations of dissolved gases in the diver's body. Nitrogen becomes an intoxicant when a diver breathes air below about 165 feet. Oxygen becomes poisonous if the concentration in the bloodstream is too high, causing convulsions and unconsciousness.

These problems are handled by substituting helium for nitrogen and carefully regulating the percentage of oxygen. Helium is expensive, so it's desirable to recirculate the diver's exhaled breath through a purification system and re-use the helium, instead of wasting it into the water. Such a system must be highly reliable—the diver's life depends on it.

### **Backpack rebreather**

Westinghouse divers use a backpack rebreather commonly known as the Krasberg rig (it was developed by Alan Krasberg). It combines two flexible breathing bags, which come over the diver's shoulders like a life vest, with a backpack containing a canister of CO<sub>2</sub>-absorbing chemical, oxygen and helium cylinders, and—all-important—an electronically controlled oxygen-regulating device.

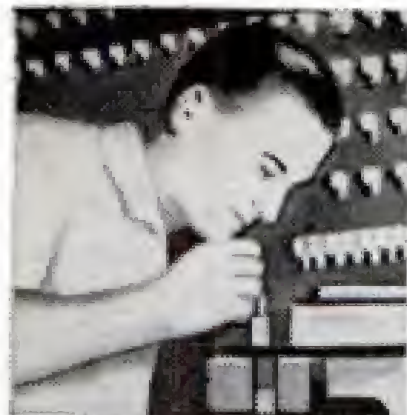
The diver's exhaled breath goes into one breathing bag and through the CO<sub>2</sub> canister, then has oxygen added to it, then flows into the second breathing bag, from which he inhales. The oxygen content is monitored by means of a fuel cell that uses a tiny bit of oxygen to generate electricity. Power output is proportional to the amount of oxygen, and this signal is amplified to control the oxygen valve.

The briefcase-size backpack can supply a diver with oxygen for about six hours, and uses only a thousandth as much helium as would be required by a diver exhaling into the water. The diver breathes about two-percent oxygen at 600 feet, and Krasberg says regulation is highly accurate.

Cold is a severe problem for deep divers. The temperature is usually around

*(Please turn to page 212)*





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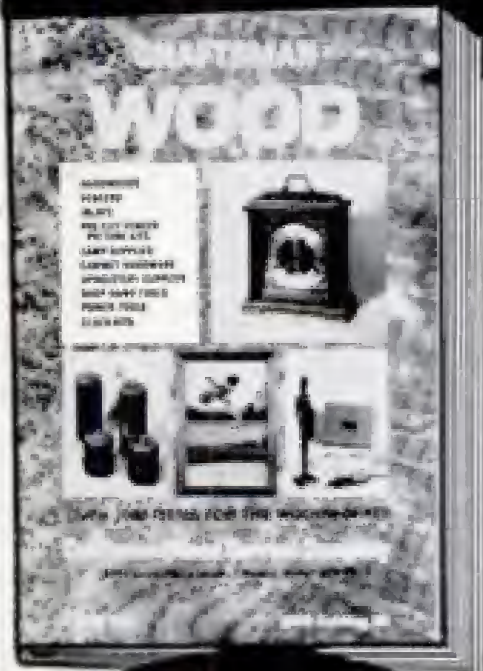
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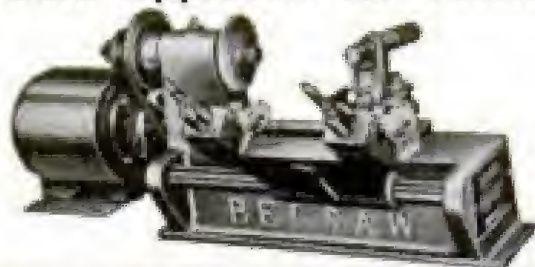
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## HOW DEEP WILL DIVERS WORK?

*(Continued from page 210)*

40°F. at 600 feet and below, and helium is more conductive than air, carrying away body heat rapidly. Divers for both companies use the same kind of water-heated suit.

But problems loom at the 1000-foot level. One is simply the mechanical difficulty of breathing. As a gas is compressed, it becomes more dense. Deep divers say that air at 200 feet becomes viscous, almost like breathing a fluid. Helium is less dense than the nitrogen in normal air, so the helium-oxygen mixture is easier to breathe, but it becomes almost fluidlike below 600 feet.

### Diver's undersea limit 1000 feet?

More important, research indicates that helium narcosis becomes a problem around 1000 feet. This has nothing to do with the chemical properties of the gas, but is a physical effect on the nervous system that results from an increased concentration of dissolved helium in the blood.

That's why Dr. Brauer and Andre Veyrune were sleepy and disoriented in the simulated dive to 1190 feet. "From a scientific standpoint, this was our most important achievement," says Brauer. "We demonstrated that there is a real physiological barrier beyond which man cannot go with the standard breathing mixture of helium and oxygen."

Brauer doesn't think that any gas mixture will enable man to function very far below 1000 feet.

At Ocean Systems, physiologist Dr. Heinz Schreiner found that human cells stop growing, become distorted, and disintegrate at a simulated depth of 2000 feet in a helium-oxygen atmosphere.

Nevertheless, Schreiner is optimistic and hopes to see a depth limit of 2000 feet for working dives within the next 20 years. He thinks 1500 feet will be well within the state of the art by the mid-1970s.

Whatever the exact figure, it appears that there is a limit below which men will never be able to survive, breathing gas mixtures and exposed to the pressure of the sea. At that depth submarines with clawlike manipulator arms will have to take over from divers. But the undersea work they can do is performed much more awkwardly than by a diver working with his hands in the water.

Will ways to penetrate the depth barrier be devised? Perhaps, since the ingenuity of deep-sea scientists constantly strains at limits imposed by nature. ★ ★ ★



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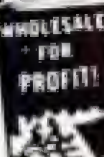
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## HOW TO BUCK A BLIZZARD

(Continued from page 98)

the crack and up against the windshield. This can help prevent ice buildup.

● *"Arctic blades":* Some experienced snow drivers use "Arctic blades." The trouble with ordinary blades is that their exposed metal surfaces get wet and freeze. "Arctic blades," which cost slightly more than ordinary blades, are entirely cased in rubber. I have used them for years, and under certain conditions they work quite well. On some windshields I have found them less effective—perhaps because of the windshield's shape. Pat Murray uses them, and while he finds them less apt to ice up, they, too, get coated occasionally and need to be "frisked."

● *Bust the snowpile:* "We can always tell a poor snowdriver," Pat says. "He starts off with a pile of snow on his roof. At slow speed in a storm, a wet pile traps more snow." Then, a few miles down the road, the driver hits his brakes. Instantly, the whole fluid mass slides forward over his windshield like a carpet, blinding him and swamping his wipers. In real trouble, he can't even see to stop. "That's why we always knock a snowpile off the roof before starting," Murray says.

Snow, he adds, should also be removed from the hood. If you don't do it, your slipstream, at speeds over 25 mph, erodes the pile and feeds a steady stream of fine snow to the windshield. In a moderate storm this may go on for ten miles.

● *Before you start:* 1. Kick off the frozen lumps that hang from fenders. When snow gets deep, these lumps drag, help lift tires, reduce traction. And if you get stuck in a snowdrift they make it difficult to get a shovel in near your tires.

2. Clean all windows. The inward slope of car windows nowadays lets snow pile deep on the glass during stops. If you fail to clean this snow away, it trickles down, freezes, may lock windows shut.

3. Besides filling your windshield-washer reservoir, add *plenty* of antifreeze to its contents. On snowy days, windshields get spattered and opaqued. And in today's fast traffic, if you suddenly need your washers but find them empty—or the jets frozen—you're in trouble. After adding antifreeze, Pat suggests running the blades until the antifreeze is pumped through the system. If jets *do* freeze, some drivers suggest stopping and thawing them with warm water. But be careful not to pour hot water on the cold glass.

● *If a "whiteout" begins:* If you've never driven in a real whiteout, you have an experience coming. Snow closes around you in a blanket. The road vanishes, posts dis-

appear. All you see is a glare of wind-blown snow. You know other cars are out there but you can't see them. Sometimes you don't know where to steer because the thick horizontal flow of snow across the road destroys all sense of direction.

For whiteouts, Pat keeps skiers' yellow-filter glasses on his car's dashboard. With these on, the edge of the road is visible. If you lack filters, try ordinary sunglasses.

● *How to "control" a snowstorm:* When a windblown storm gets *really* dangerous, one trick is so simple few drivers think of it, Pat says. Simply turn around, when you can do so safely, and go the other way. I tried this technique not long ago in a vicious night whiteout. I was headed into a snowstorm that was blowing in 30-mile gusts. When vision became almost impossible, I turned around and started back. Instantly, I could see! The storm was as bad as ever, but now I was moving east at 30 mph, the same speed as the wind. Soon I found a motel, stopped, then continued the next morning.

● *If you have to turn around:* There's a right and wrong way in a snowstorm. Let's say you're on a conventional two-way road. Snow is getting deep. If you try to turn in the roadway itself, your rear wheels may spin and refuse to climb the high center crown. You may get stuck. The best bet is to slow down, watch for a clear driveway (or side road) that slopes up from the highway. Stop just beyond it, then make a backing turn with enough momentum to carry your wheels up *onto the driveway (or side road)*. Now it's easy to roll forward and turn the opposite way.

● *To turn around on a curve:* Here's where many highway jams develop. A driver sees a car stuck on a curve ahead, stops, tries to make a 180° turn on the same curve and slews across the road.

"The mistake most drivers make," Pat says, "is getting trapped on the lower side of the curve. They either back, or advance, *down* the slope. Once they have one pair of wheels lower than the others, they can never complete the turn. The right way is to back in an S-curve. *Start backing down the slope, but immediately reverse your steering and let momentum carry your rear wheels to the high side of the road.* Now it's easy to roll forward. The slope will help you complete the turn."

● *When the going gets rough:* Put extra weight in your trunk! I know some experts advise against this. They worry that heavy weight in back can help spin you out on fast turns. And, of course, it can come forward and wrap around your neck if you hit something. But you don't go racing around fast turns in snowstorms. Nor

[\(Please turn to page 216\)](#)





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## HOW TO BUCK A BLIZZARD

*(Continued from page 214)*

do you, if you're even "average-good," run into things!

What some experts overlook is that when the going gets tough and the snow is deep, you're a menace to everybody if you don't have plenty of traction weight. It's mainly weight over the driving wheels that keeps big cars moving smoothly. And it's weight that keeps trucks moving when many cars are sliding around. Also, the best snow tires in the world won't help if snow is pushing up underneath your car.

Often passengers in back are all the extra weight you need—or a shift in baggage and a full load of gas. If not enough, many snow drivers add sand. Burr Hartman says he never goes into a storm without 100 pounds of sand over or just behind the rear wheels. Pat insists on 300.

After the storm, of course, it's only sensible to get rid of excess weight. Many drivers on long snowstorm climbs up here put rocks in the trunk for traction. Rocks are dangerous things to have in a car, but, again, it's a question of what is *least* dangerous in a temporary emergency.

● *If you start snow-busting:* When snow gets so deep they must buck their way, many drivers plug ahead, losing speed until the rear tires spin. Then they're stuck.

Never force a car into snow. Ease it into heavy stuff as far as it will roll. Catch it instantly when it stops and roll back a few yards—before it can settle in. And be careful to back out in the same track. Now get a new start, without wheel spinning, and bust a few more yards. Keep doing this until you get through the drift area.

After getting past deep drifts, some drivers find their engines boiling. The trouble is that in drift-busting, snow can clog your radiator. So, it is important to stop in a safe place, open the hood and inspect the radiator and grille. If clogged, close the hood and let the engine idle. If the radiator tends to boil, turn the engine off—its heat will melt the blockage, often within ten minutes.

However, in heavy going, Pat Murray says, you may also find large quantities of snow packed solid around the engine itself. When this happens, he scoops it out.

● *If you spin out:* Many drivers spin and get stuck needlessly. "Seems they never heard of the simple art of backing," Pat says. "Nor do they know about straightening their front wheels."

A car that spins usually stops with wheels turned right or left. And this is like dropping anchor—in deep snow it's all but impossible to move. "Unless they're down in a ditch," Pat says, "we get most

cars out by merely unwinding their front wheels, then backing a little."

Here is where many drivers go wrong. They try to ram the car out and get stuck deeper. They don't take time, Pat says, to discover the pressure-points that need to be broken down. Before you back, get out and look things over. Look under each section of the car. Know exactly where "pressure snow" needs to be loosened and pulled out. A garden rake or hoe is a good tool to have along, as well as a shovel.

Before straightening your wheels, also remove snow that is pushing against your sidewalls. Otherwise, the wheels will pack this snow solid when you straighten them. Heat of compression melts snow, enabling it to freeze into a hard wall.

Next clear a "backing track" behind each wheel—a good yard or two—and a "starting track" in front of each wheel. If there's any slope or crown to the road surface, note in advance which way the rear wheels will shift. Put sand or salt on that side. (While doing all this, you have also been helping yourself in another way. By *not* trying to blast your way out immediately, you've let your tires cool. And cool tires bite best.)

● *Use those flares!* While trying to get unstuck, place flares out in both directions. Being stuck in a snowstorm, Pat says, is like being stuck in fog. You may get run over before anyone sees you.

Don't skimp on flares. Use plenty—the worse the storm, the more flares. "We never go into a storm without a good supply," adds Burr Hartman.

● *A "skylight" at night:* One danger in snowstorms is being overtaken while moving. You're feeling your way. Your taillights are frosted over. Even if clear, they couldn't be seen because of falling snow. Suddenly, a faster vehicle looms up behind you, not seeing your snow-sheathed car, and hits you. To guard against this, experienced snow drivers aim spotlights up into a storm and back—about 15° from vertical. The loom of such a "skylight" often can be seen long before taillights become visible. (Even some big trucks run with this protection.)

In a snowstorm, you can't have too much rear protection. In a recent bad storm, I saw a red flare sputtering in the dark. I got ready to stop, then realized the flare was on a big truck I was overtaking. Its alert driver, knowing his trailer was sheathed in ice and all but invisible, had lighted a big 30-minute flare and jammed it into the tailgate on the left side. This had its dangers. A flare in the wrong place could start a fire. But in this storm it was the one light bright enough to be seen—one that certainly wouldn't ice over! ★★ ★





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## SO WHAT ELSE IS NEW?

*(Continued from page 118)*

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"We particularly want you to note," said the catalog, "the advantages of the *close-coupled* body and long wheelbase (141 inches) where all the passengers are placed so far forward of the rear axle and in the most desirable position for easy riding." Passengers in this Austin got what for them was a safe, easy ride.

● *Four-on-the-floor.* With wood-rimmed steering wheels, legible instruments and manual transmissions that can be adapted to all kinds of ratios, the automotive fraternity appears to have turned the full circle in a little over two generations. But the *close-ratio*, sports-type manual transmission is more than 66 years old. Back in 1902, Mercedes was importing into the United States a four-cylinder, 60-hp sporting model of 563-cu.-in. displacement that transmitted power to the rear wheels through a standard equipment *close-ratio*, four-speed box. Shift action was described by the manufacturers (and by enthusiastic owners) as "akin to a good knife slicing through the best butter!" Not bad, during an era when even the term *synchromesh* was unknown. And you didn't have to pay extra for this option as you do today.

● *Four-wheel drive.* The four-wheel drive system, popularized by thousands of Jeeps during World War II and now appearing on racing cars for greatly improved stability and cornering, is around 60 years old. Back in 1908 a handsome and costly (\$4500) automobile called the Badger appeared on the market. Its designers were Otto Zachow and William Besserdich who devised a four-wheel drive system which could propel the car "through deep snow." The Badger, produced by the FWD Automobile Co. of Clintonville, Wis., had a four-cylinder, 60-hp engine and was built in limited numbers.

● *Superchargers.* The history of the automobile, both here and in Europe, is underscored by many attempts to introduce the supercharger (or forced-induction system) as an assembly-line feature, available to any buyer. Other than in racing, these attempts have not been successful. Alvis tried it in England, Mercedes in Germany, Alfa-Romeo in Italy and so on, but the idea never really caught on.

There are, of course, three types of superchargers, each with its own advantages and weaknesses. The oldest is the centrifugal blower, next is the positive displacement type and the newest is the so-called turbocharger adapted to Offy engines at

the racetracks. In this one, the exhaust gases are used to compress the air which is rammed into the cylinders for combustion.

Although most people know the supercharger is not new, they have no real notion how old it is. The Chadwick Co. of Pennsylvania produced a model that had a three-stage centrifugal supercharger—and that was in 1905!

● *Front-wheel brakes.* It is probably fair to credit Duesenberg with the first production automobile featuring four-wheel brakes; and that was back in 1921. But brakes up front in an automobile go back a lot farther than that. The oldest known patent on four-wheel brakes was taken out by an English firm back in 1906. But, after three years of trying to iron out bugs caused by steering lock, the firm gave up.

The Italian firm of Isotta-Fraschini, however, made a design work. The Isotta-Fraschini car can be said to have predated the wide-scale adoption of four-wheel mechanical brakes by some 15 years. This magnificent automobile, (chassis price tag alone was \$9000!) had *three* sets of mechanical brakes, all of the contracting type. Separate pedals operated the pair on the rear wheels and the water-cooled differential brake. The front brakes were actuated by a hand lever, so the driver must have been pretty busy when making a panic stop.

The Isotta could not claim that its four-wheel brakes were coupled as an integral system. The Duesenberg could. So could the Argyle and Perrot. The Isotta boasted 628-cu.-in. for its four-cylinder engine and developed 120 hp. It obviously needed all those brakes! ★ ★ ★

## CAN CHRYSLER CRUNCH CALE?

*(Continued from page 90)*

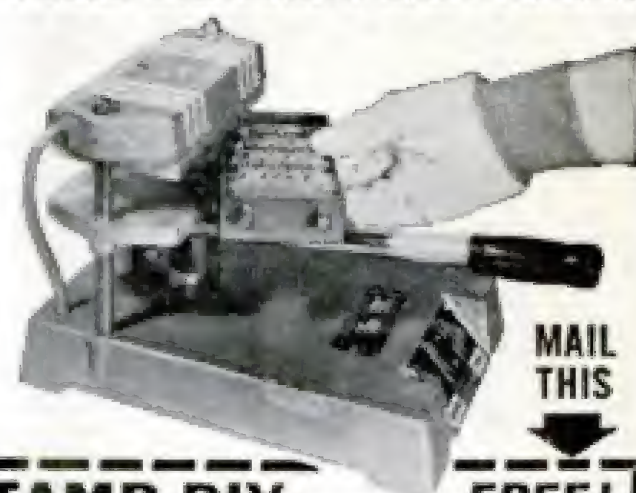
cross over into a sort of never-never land wherein control of the car becomes pretty marginal. This, naturally, creates a tendency to back off, particularly in the corners, something that can't (never has, anyway) win races at Daytona, strictly a "flat out" track.

How the drivers and their crews will cope with these problems created by the sharp boost in speed over the past year is, of course, what makes racing. For the solo runs of qualifying, suspensions will be "loose" to allow drifting and maximum speeds through the corners. But on race day itself, when traffic is fast and thick, suspensions will be snubbed down. Still, with all that power, speeds will be higher than ever, the race more exciting than ever.



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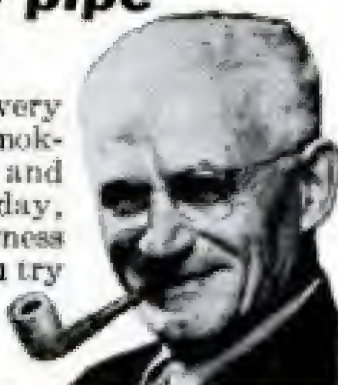
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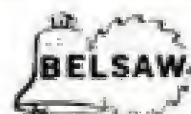
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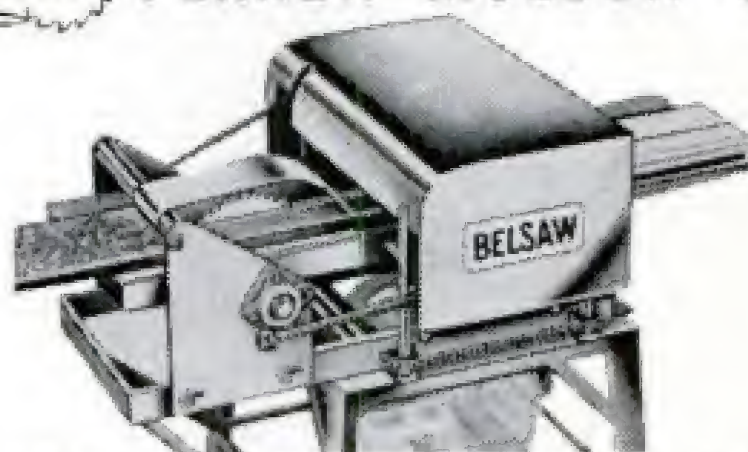
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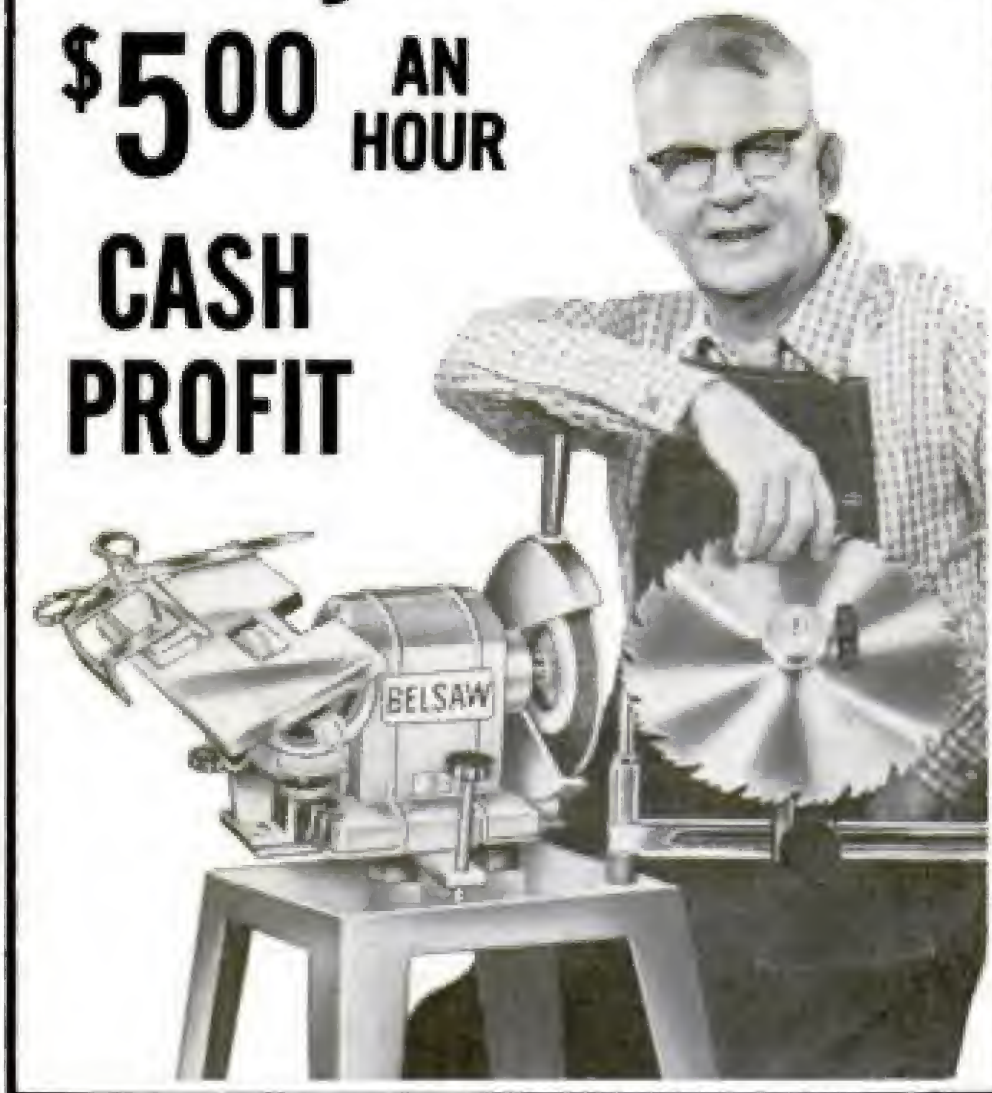
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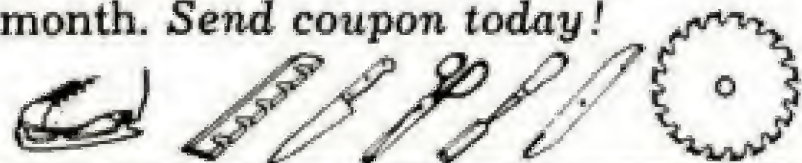
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## MOON BUG LEARNS TO MATE

(Continued from page 125)

the Earth into an elliptical orbit behind the command module and lower in altitude. The LM will remain in this orbit until considerably separated from the CSM.

Next, the LM must climb back up, simulating ascent from the moon. Actually, the descent-stage engine will be used for the first part of this trip, then this stage will be jettisoned, using an explosive-driven "guillotine" to chop electric cables connecting the two sections. The ascent engine will then, for the first time, be used and LM will close with the CSM.

The maneuvers can be executed automatically by a guidance computer. The pilot inserts a program code by pressing buttons on a keyboard; the numbers show up on a lighted display panel so he can make sure he has dialed the right code. He then pushes an "enter" button to feed the code to the computer, which selects the designated set of instructions from its memory. When the pilot is ready, he pushes a "start" button. Watching the attitude display and other instruments, and the view through the ports, the astronauts can monitor the maneuver and take over from the computer whenever necessary.

As the LM approaches the CSM, the spacecraft will be flipped over so its engine can be used for braking. The reaction-control jets are used for docking. At a distance of about 50 feet, once the two spacecraft are aligned, the pilot can't see through the front viewports and then uses a tiny window above his head for final positioning. As the tricky maneuver is completed, the probe and drogue engage, and the Command Module pilot triggers the probe piston, drawing the two ships together. Tunnel latches are fastened and hatches are opened between the space cabins. The probe and drogue are demounted and left in the LM cabin. Its crew crawls back into the command module and closes the hatches. The CSM pilot fires an explosive charge that severs the docking tunnel, and the LM is set adrift. After the CSM is clear, the LM's ascent engine, under ground control, is fired for the last time to monitor its burnout characteristics.

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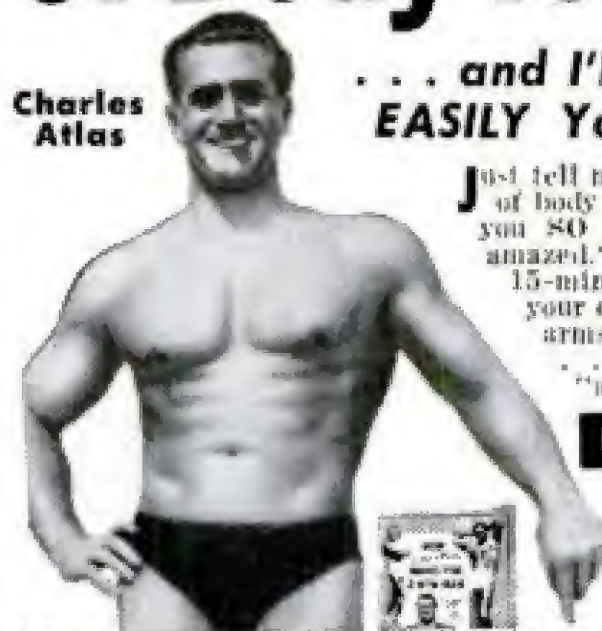
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**BAIT WELL** is located in the stern. On a three-day trip, I was able to keep a dozen waterdogs alive

## LAKE POWELL

*(Continued from page 129)*

(1850 pounds) and length soften the blow.

Once out of the Narrows, Lake Powell opens to a half mile in width. This is one of the widest stretches along the whole lake. It's also one of the most panoramic. Huge buttes stick straight up from the desert shore. High, wind-carved walls line the opposite shore. Deep color in the red rocks appears to change with every turn.

In this calm-water section, I test Vagabond at just under full throttle. At 4000 rpm the speedometer registers 32 mph. Again, she handles well though the steering is a little heavy. An adjustment of the power tilt and power trim on the Mercruiser stern-drive unit corrects this.

Rounding the point at Gun Sight Butte, I try some turns. Vagabond holds well on wide come-arounds, but she tends to slip just a bit on wheel-hard-over turns. This is not serious, and is more than compensated by the stability of the cathedral hull.

We're 50 miles from Wahweap when we turn into Rainbow Canyon. At canyon's end the Park Service has built a dock. You tie up here and walk a mile and a half to an incredible sight—Rainbow Bridge—the largest known natural bridge in the world. More people saw this arch last year than the total number of people who have ever seen it before. Lake Powell is responsible. You get here only by boat, unless you want to walk 14 miles from the nearest road through the Navajo Indian Reservation. But today, you can boat for three hours, walk for 15 minutes, then stand and wonder at the arch which is 309 feet high and 278 feet wide.

Heading from Rainbow Bridge to the

main channel, we stop at a unique marina. The Park Service has anchored a dozen floating docks in a sheltered basin.

You can buy gas and supplies here. We stop to gas. I find that Vagabond takes 13.9 gallons after a 50-mile trip. The boat has an 18-gallon tank that is considered standard equipment. I would suggest, though, that anyone cruising Lake Powell have extra fuel tanks installed.

After overnighting at Rainbow, we cruise to Bullfrog—about 50 miles up-lake. On the way, we take a side trip up the Escalante River, about 15 miles from Rainbow. It's off the Escalante that we photographed the Vagabond blasting through Davis Arch. (See photo on page 126.) If the lake ever reaches "full pool," this arch will be submerged. Right now, there's only six-inch clearance for a boat on plane. I do not recommend that you charge through this opening at top speed, but I do suggest you see it. It's up Fifty Mile Canyon.

We spend the last night on the lake camped on a beautiful beach. Actually, I wanted to camp in the Vagabond.

The "tent," covering the main cockpit, is good. You have full headroom when all the curtains are in place. With a small heater inside you can be very snug on cool nights. The two bunks under the forward bow-riding deck are quite comfortable. Each of the two lounge-seat bunks in the cockpit will hold a good-size sleeping bag.

But there is one problem—zipping up the curtains. You have to manipulate 20 zippers to get the "tent" up. I'm sure that after raising and lowering the tent several times, the canvas will stretch a bit making the job easier. But this time, it takes me 45 minutes of tugging and pulling to get all the zippers zipped. There are advantages to zippers, but I have long disliked them especially around water. They corrode and break apart. The zippers used in Vagabond are heavy-duty and will probably hold up, but I did have one pull apart on the first "tent raising." Snaps are better, though harder to work.

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Vagabond's specifications: length, 21 ft., 5 in.; transom width, 85 in.; weight, 1850 lbs.; mechanical steering; stern-drive power options up to 210 hp; suggested price, \$5595 with the 160-hp engine. ★★



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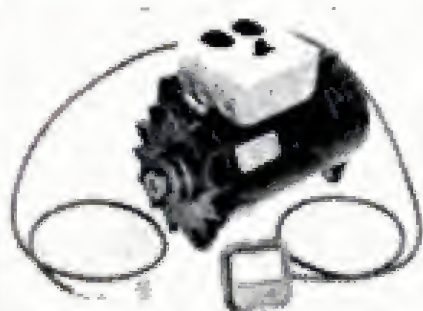
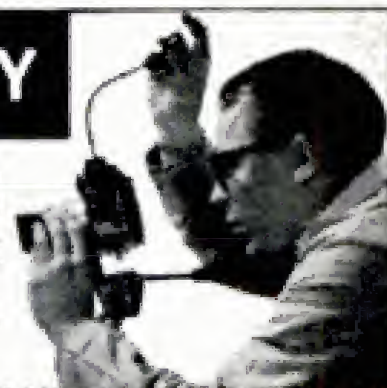
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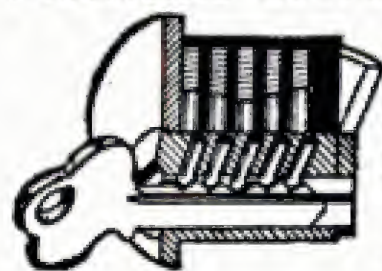
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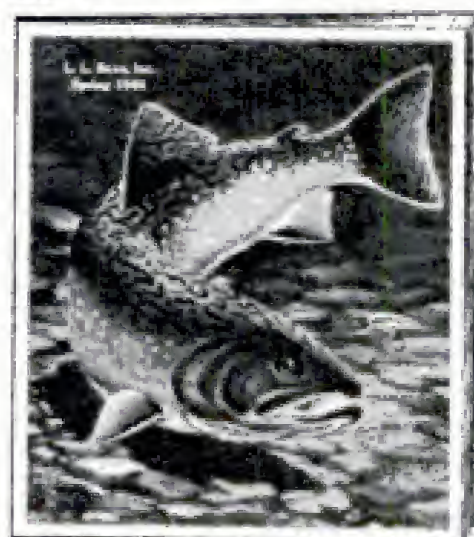
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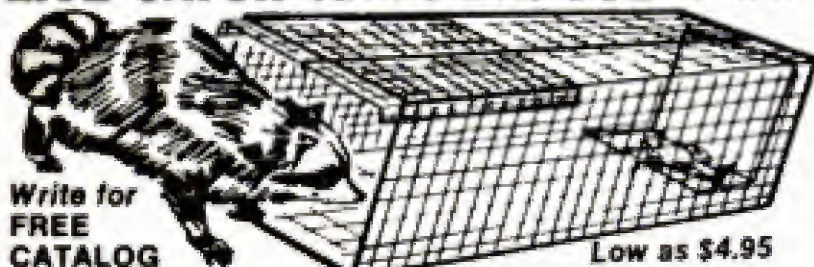
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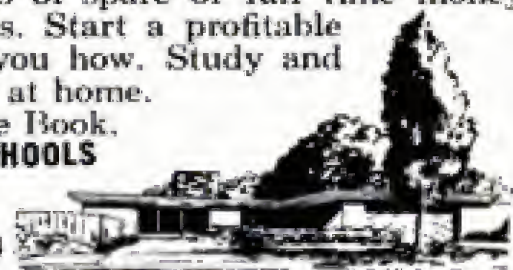
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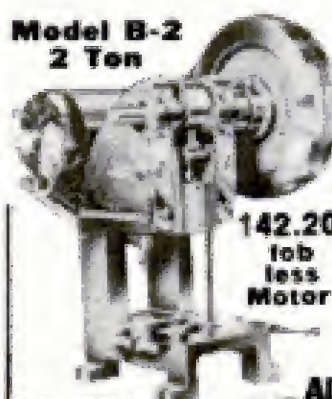


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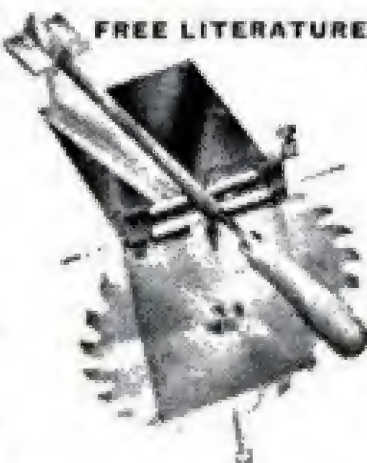


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## HOW TO SPOT A BAD HOUSE

*(Continued from page 146)*

room pass-through wall, a shiny new wall oven or appliance plug-in center, intercom systems, showy fireplaces, wrought-iron balcony rails, roof pagodas.

To be sure, "gimmicks" sometimes can be perfectly functional and nice to have. The gimmick house is a trap to avoid, however, when one or two eye-catching features propel an unsuspecting couple into buying a house that they otherwise would not touch with a 10-foot pole. Is the house and its overall design and construction good, really good for you and your family? That's the key question.

How do you tell the difference between the marginal house and a really good house? It comes down to knowing the distinguishing traits of good-quality products and materials.

Buying a new FHA-insured house is a big step in the right direction. It means the house is built according to FHA's Minimum Property Standards. By and large, these building standards are stiffer than any others in effect for houses today. But they do not mean that you will get uniformly high quality throughout the house. You therefore must go a step further to avoid marginal quality even in an FHA house.

### Eleven quality checks

Here is a summary of high-quality features to look for when you buy a house.

1. *Foundation walls* of poured concrete are usually better than concrete or cinder block walls. Poured walls offer better natural waterproofing and are more durable.

Concrete-block walls should be parged (plastered) with a half-inch of cement mortar on the outside. Much extra strength is gained if they are reinforced with steel mesh or rods. These would be placed in mortar beds between courses of block—generally every few courses.

Whichever type of foundation, ask for troweled-on waterproofing instead of the usual brush-on or spray-on type. If local water conditions are bad, this can be further improved with a film of polyethylene or asphalt-impregnated membrane.

A system of tile drain pipe should be put in the ground around the house at the base of the foundation walls, except in dry areas. This gets rid of ground water that would otherwise get into the basement.

2. *Termite protection* should be there with either soil chemicals, chemical-treated timber or termite shields. A poured concrete foundation will provide additional protection.

3. *Exterior walls* obviously should be

rugged and durable with a long-lasting finish. Prefinished wall siding is highly recommended to reduce repainting. It includes prefinished hardboard or wood, aluminum siding, galvanized steel, plywood and mineral fiber sidings.

If the walls are painted, insist on top-of-the-line paint, the very best. It should be a well-known brand. Get a three-coat job—primer and two finish coats. Make sure the siding is applied with double-galvanized, aluminum, or other rustproof nails.

4. *Interior walls* are usually made of half-inch plasterboard today, which is better than the  $\frac{3}{8}$ -inch plasterboard sometimes used. Even better is the  $\frac{5}{8}$ -inch thickness. The builder should use three layers of compound over joints and nail-heads.

### Are walls well finished?

On paneled walls, prefinished materials give easier cleaning, plus resistance to soiling, marring and stains. Wood paneling gains fire resistance if applied over plasterboard or asbestos-cement board instead of directly to the framing members. With plaster, two coats over metal lath is good, three coats better, though rarely done today.

5. *Flooring* should be closely fitted and display no wide gaps and no high edges. No squeaks should be heard when you walk over it slowly. Resilient flooring starts with asphalt tile, the cheapest and lowest quality; it's good for a concrete basement floor, but that's about all. Vinyl is best for most uses. Rubber has only fair resistance to oil and grease. Cork can look exceedingly rich and handsome but will soon look worn in heavily traveled areas. There's also sheet linoleum, the granddaddy of composition flooring, which is cheap. Get the heaviest gauge available.

6. *Windows and doors* should be a well-known national brand, such as Andersen, Malta and Pella. They should fit tightly, open and close easily, and be easy to clean from inside. Weatherstripping should be built into the frames; you should see it. Aluminum windows should contain plastic fittings which prevent a direct connection (thus no cold flow) between the movable parts and the frame.

7. *The kitchen countertop surfaces* should be a plastic laminate (such as Formica, Micarta, Panelite) or possibly ceramic tile, which is even tougher though it's hard on dropped chinaware. Best kitchen cabinets are those of a brand-name manufacturer with a rugged factory-applied finish.

There should be enough electric outlets

*(Please turn to page 230)*



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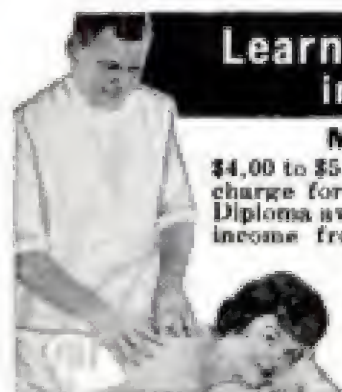
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## HOW TO SPOT A BAD HOUSE

(Continued from page 228)

behind the countertop for plugging in small appliances, and one or two double outlets where the kitchen table will go. Overhead lighting should flood the length of the countertop; one light in the middle of the room is not enough.

### Special attention to bathrooms

8. *Each bathroom fixture* should show the imprint of a national manufacturer (Standard, Briggs, Eljer and Richmond are some). This is important because manufacturers do not stamp their imprint on their lowest-quality fixtures. An enameled cast-iron tub has the edge over the enameled-steel kind. Cast iron is less apt to chip or wear and comes in more styles and sizes. Tall people in a family who like to take tub baths should be sure the tub is long enough. They range in length from six feet long down to pygmy length.

Flushing action is the key to toilet quality. Cheapest of all is a washdown model which is poorest and the least sanitary. Next steps up in quality are: the reverse-trap action unit, siphon jet, which is quite good, and the siphon jet vortex, best of all and the kind used for luxury one-piece, quiet-flush toilets. The one-piece wall-mounted toilet makes cleaning the bathroom easier, though it has a luxury price tag. Whatever the toilet model, test it for noise by flushing it.

The best lavatory bowls are made of gleaming vitreous china. They are only slightly more expensive than enameled cast iron, which is next best. There are also enameled-steel bowls, third in quality and more susceptible to chipping and wear.

Good faucets are made of solid brass with a tough coat of chrome, nickel, or brushed or polished brass. The marginal kind are usually made of lightweight zinc or aluminum castings, which tarnish quickly, drip and look dreadful within a short time.

An "automatic diverter control" should come with a combination shower-tub. It automatically diverts the water back to the tub faucets after one has showered. That prevents the next person in the tub from being pelted with hot or cold water. Omission of the diverter, an inexpensive item, can cause accidental scalding of children.

Waterproof floors and walls, particularly around the tub and shower, are also essential. Ceramic tile is the old proven wall and floor material, and you can hardly go wrong with it. There are also rugged new plastic wall tiles and materials, such as

melamine-coated hardboard, which are very good.

As for flooring, avoid linoleum and asphalt tile in the bathroom. They quickly fall prey to water rot, as well as being hard to keep clean and attractive. The flooring should be a tough pure vinyl or comparable material, ceramic tile, or, say, marble or terrazzo.

Also check the bathroom for safety features such as grab bars in the shower (to prevent falls), a waterproof shower light, electric outlets well out of reach of the shower, tub and lavatory water (to prevent being electrocuted), and good-quality soap holders and towel racks.

9. *Good plumbing* starts even before the water meter. The water-supply pipe from the street to the meter should be at least one inch in diameter, rather than the usual half or three-quarter inch. That insures ample water and water pressure to the house. Shutoff valves at every fixture are a must, allowing the water to be turned off by hand in case of repairs.

10. *The water heater* for gas or oil ordinarily should have a tank capacity of 40 to 50 gallons—at least 80 gallons if electric. In a new house, the kind of guarantee is the tip-off to quality. It should be guaranteed for at least 10 years.

If the water heater is an integral part of the hot-water heating boiler used for heating the house, minimum rating for a one-bath house is 2.75 gpm (gallons per minute of hot water); at least 3.25 gpm for two baths, more for a large family and large house. The rating will be on the boiler, which also should have an IWH seal for good quality. That stands for an approved Indirect Water Heater. If there's no IWH seal on the boiler, the quality is probably poor.

11. *A septic tank* should have a capacity of at least 900 gallons for a three-bedroom house, 1000 gallons with four bedrooms or a large family. It's best when the tank and its pipe system (leaching field) are located in front of the house. That will facilitate the lowest-cost, most direct connection to the street sewer later.

*Additional features:* The heavier asphalt roofing is, the longer it will last. Asphalt roof shingles of 235 pounds in weight are considered the least to accept. They also should be either the seal-down or glue-tab kind to stay put on a roof in an area where violent windstorms or hurricanes occur.

The attic should be fitted with large air vent louvers, not the small kind. These not only help cool the house in summer, but also provide essential attic ventilation the year around (to prevent condensation and wood rot problems under the roof). ★★





## Hearing test for newborns

The hearing of newborn infants can be tested with a new instrument, the Zenith Neo-Meter, so that problems can be diagnosed early. Pushing each of four buttons causes the instrument to make sounds of increasing loudness. The newborn responds by blinking.



## Street vacuum cleaner

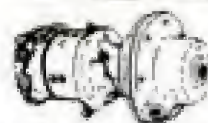
Undergoing recent tests in New York City is a street-cleaning vehicle that works like a giant vacuum cleaner. The British-built device picked up such litter as bricks, broken glass, tin cans and the contents of litter baskets.

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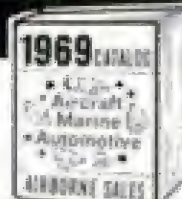


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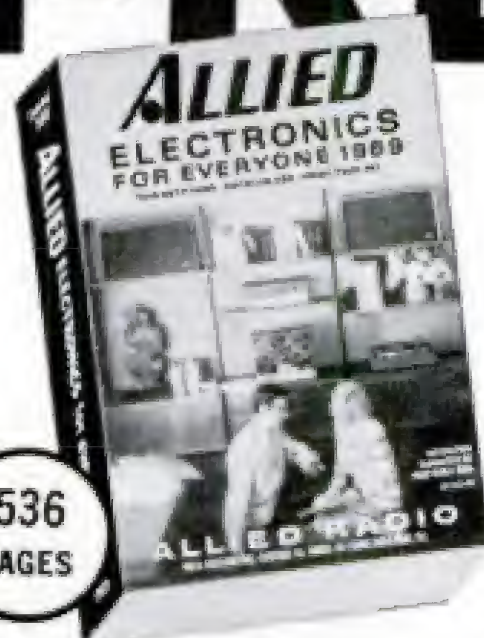


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## QUEEN ELIZABETH 2

(Continued from page 103)

air upward and carry the exhausts clear of the quarterdeck.

Well forward of the funnel, there's what appears to be a mast. Its hollow center carries the exhaust air from the galleys. At the top is a special antenna for navigation by satellite, and by which her position may be fixed at any time of day or night to the fantastic accuracy of 300 feet.

On the bridge, Capt. William Warwick is aided by science like no other merchant skipper. A miracle, quarter-million-dollar, one-cu.-ft. computer system lined to 400 vital shipboard points takes over much of his drudgery: collecting and analyzing weather reports and advising on suitable courses; writing the engine-room log; watching for the slightest overheating or other malfunction in the works; controlling the intricate machinery in the interest of economical running; predicting fresh-water needs for optimum operation of the desalinization plant; listing the food, drink and domestic necessities—3000 items—to be loaded at the next port.

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**At press time, Cunard announced that it refused to accept the *Queen Elizabeth 2* from the builder because of uncompleted interiors and faulty turbines. It was feared that corrective work would delay the *Queen's* maiden voyage to New York.**

---

At the wheel—a toy of a thing only 14 inches across—Capt. Warwick has an immediate choice of two manual steering systems—or he can change to automatic at the flick of a lever. Behind, on a 12-foot control panel, he can read at a glance every detail of the performance of watertight doors, lighting arrangements, tachometer indicator, rudder indicator—every single thing aboard his ship, except who's dancing with whom in the 736 Nightclub.

Meanwhile, on the 10 decks available to passengers, as many as 2025 people are exposed to a luxury that reflects the 1½-million man-hours that were spent designing this ship. In the cabins—three-quarters of them have a sea view—only 178 passengers in a chock-full ship will have to sleep on upper berths. Even the dog kennels offer a vista of the ocean.

In the bow-facing "Lookout" lounge, children of ages up to 80 will enjoy the shiny red Chart Reader installed for their amusement. Linked to the bridge, it's a mini-TV screen; by pressing buttons on its side, the chart of the day lights up within the frame; gamblers on the Ship's Run sweepstakes will doubtless spend many calculating hours gazing at it.

The range of facilities stretches far beyond normal shipboard expectations. The three do-it-yourself launderettes cut out the need to use expensive laundry services. All four swimming pools are heated; the two outside ones are carefully sited near the stern out of the breeze. There are both Turkish and sauna baths; and every cabin of each class has a private bathroom.

For the first time, a shipping line has admitted that many passengers want to bring their cars—but don't like seeing them handled by cranes. Huge doors in the hull allow your car to drive on, drive off at high tide or low. An elevator whisks 40 cars an hour down to the hold; a built-in turntable allows for quick maneuvering into the 80-car capacity garage. At a round-trip cost of \$500 for a compact, taking your car may prove as cheap as renting one for six weeks in Europe.

Built in an astonishing 40 months, the *QE 2* now starts on a hectic program of Atlantic crossings and luxury cruises: In an average year, she'll make a dozen spring and summer round trips between New York and LeHavre/Southampton. Then, in fall and winter, she'll follow the sun through the Caribbean, Bermuda, the Canary Islands and the Mediterranean. Forget the idea of getting from A to B, says Cunard: Treat us as hoteliers.

Back in the early 1950s, the *Mary* and the *Elizabeth* were aging rapidly. At first, there were tentative plans for a third vessel of the same type, provisionally termed *Q3*. But *Q3* was never built, for Cunard realized in time that the pattern of travel had changed dramatically.

So, the new ship—Job No. 736 to John Browns, the Scottish shipbuilders—had to cultivate an appeal of her own. (See *Successor to the Queens*, page 106, Sept. '67 PM.) and, she had to be readily adaptable from the trans-Atlantic run to the more leisurely requirements of winter cruising. The use of aluminum on a scale unparalleled in shipbuilding has given a seven-foot reduction in draft compared with the *Queens*: She can now berth at Southampton at all tides, and can pass through the canals of Suez—when and if reopened—and Panama, the latter with only 30 inches to spare either side. There's now no effort by Cunard to compete with the airlines.

"Ships have been boring for long enough," admitted C.N. (Nick) Anderson, president in America of Cunard Line. There should be little opportunity for boredom on the *QE 3*; there is every luxury and facility that you could find at a first-rate Florida resort hotel, except actual beach; although there's even some of that in the children's sandpit. ★★



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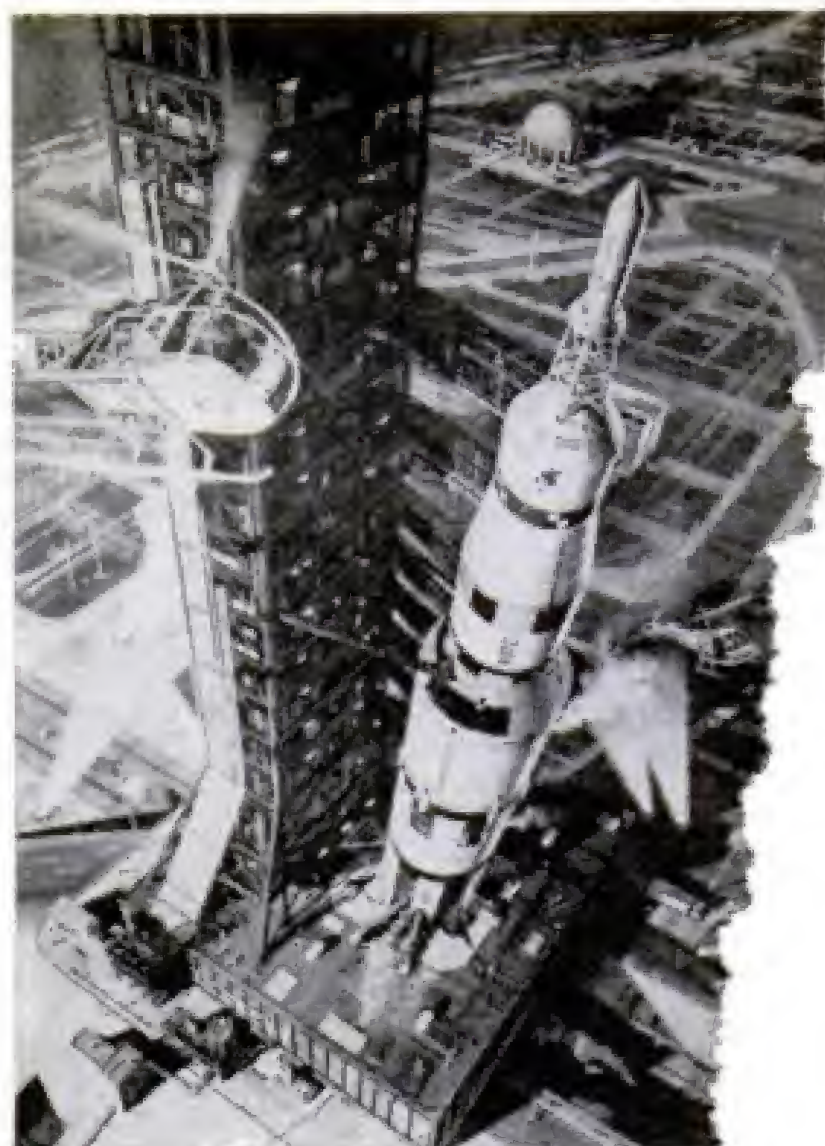
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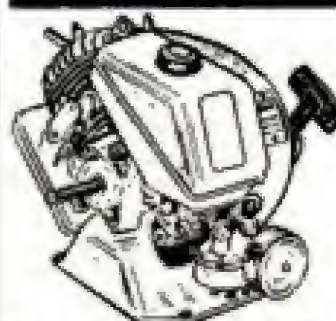
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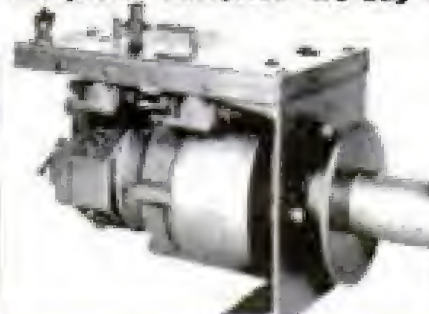
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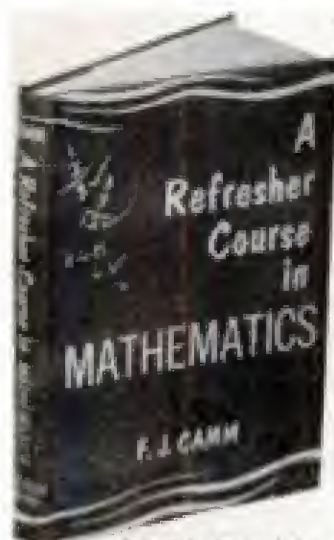
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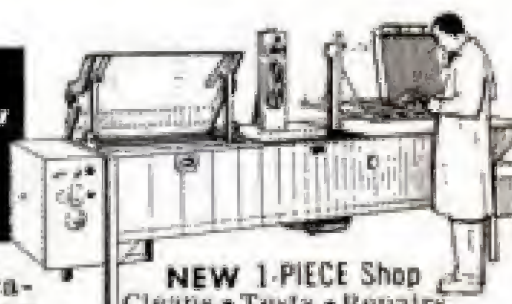
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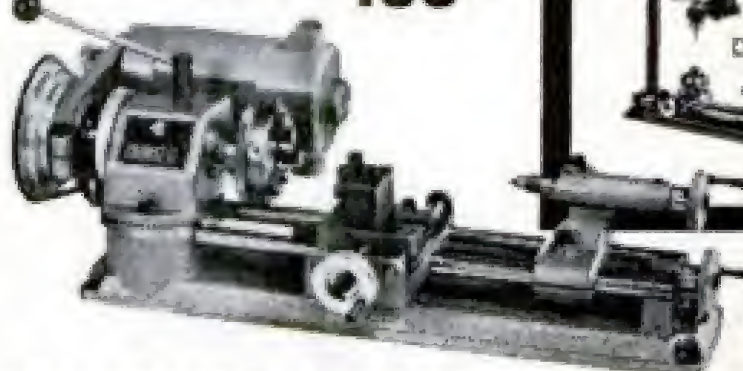
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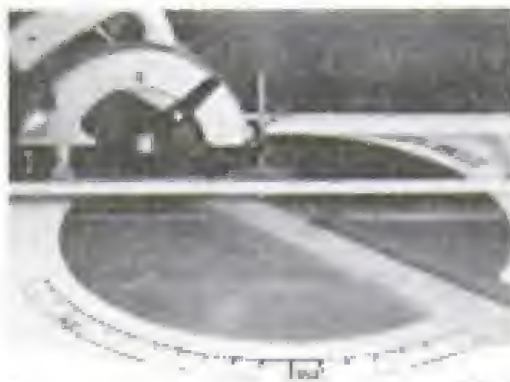
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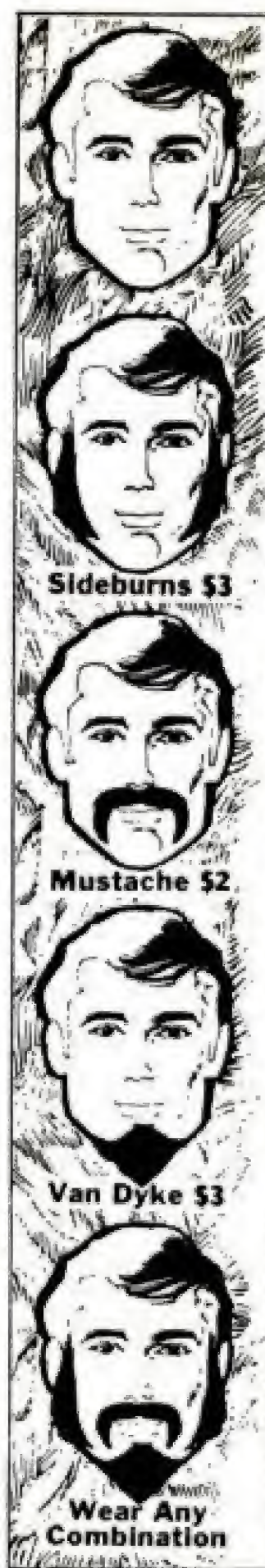
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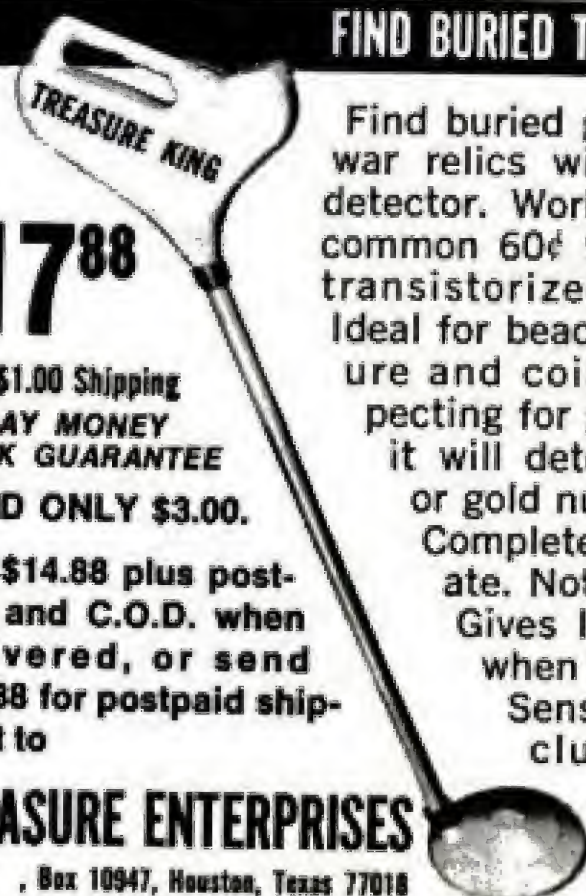
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This wheeled projectile is 30 feet long and 37 inches high. It looks a lot like a bullet. And it goes like one, too. On one of the early runs it topped 400 miles per hour easily. And it was just warming up then.

It has two 427-SOHC Ford engines. A conventionally aspirated one producing 810 horses up front. And a supercharged one producing 1260 horses in the rear. These engines cost over \$6,000 apiece.

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# The Evinrude Triumph is unfair



Triumph's aimed intake passages "loop" the fuel charge up and away from the exhaust ports. Deflectors and all their problems are eliminated. Note the flat-top automotive-type pistons, the fuel passages molded into the cast iron cylinder sleeves, the fuel delivery "window" in the piston skirt, and the efficiently shaped hemispherical combustion chamber.

## It has a built-in \$5,000,000 advantage.

The advantage is "loop charging"—a new, dramatically more efficient way of fueling a modern outboard engine.

Loop charging delivers an *aimed* fuel charge *directly* to the top of the combustion dome. It eliminates need for the deflector "hump" on the piston and the deflector-shaped "bulge" in the combustion chamber.

With the deflector gone, pistons are lighter, compression can be higher, and the combustion chamber can be shaped the way it ought to be shaped.

The loop principle isn't new. But because of the problems of building precision fuel passages into the spaces between cylinders — it has never before been possible to build a true loop system into a modern water-cooled multi-cylinder aluminum outboard engine.

A year ago, Evinrude engineering broke through the design barrier.

The method was ingenious (see diagram), and the results were spectacular. One result of our \$5,000,000

research and tooling investment was an immediate saving of as much as a gallon of fuel an hour in the top speed range (where fuel savings really count).

Fuel economy is exceptional. But so is performance. The Triumph "55" actually equals our workhorse "65" in pulling power, and surpasses it in speed and quiet and push-button elegance. The Evinrude "55" *eliminated* the Evinrude "65".

We hadn't planned on being quite that unfair.

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